Pit and Quarry

With which is consolidated

CEMENT-MILL & QUARRY

June, 1936

The adaptability of the Fuller-Kinyon System is well illustrated in the photograph below. Two 12-in. pipe lines convey cement a distance of approximately 3600-ft. from storage silos at the plant to the cement carrier, "Santacruzcement", shown at end of the pier. This installation was made in 1935 by the Santa Cruz Cement Co. at Davenport, California. Cement is shipped in bulk and unloaded at four storage and packing stations along the Pacific Coast. The cement carrier, as well as the four storage stations, are equipped with Fuller-Kinyon Systems.

FULLER COMPANY

CHICAGO CATASAUQUA, PA. SAN FRANCISCO

Pages 39-43

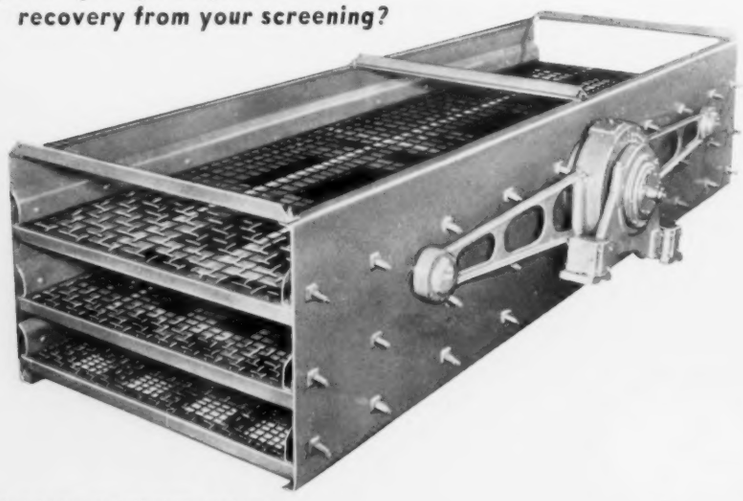
Since 1929 the largest net paid A. B. C. producer circulation in the field

OVER 2,000,000 TONS

WITHOUT A CENT . . . FOR REPAIR COST

- **Over two million tons of aggregate have been accurately sized on one 4′x8′, 3-deck SELECTRO Vibrating Screen—Handling 300 tons per hour. . . . *Still in best running condition.***

- ***Are you getting maximum recovery from your screening?***



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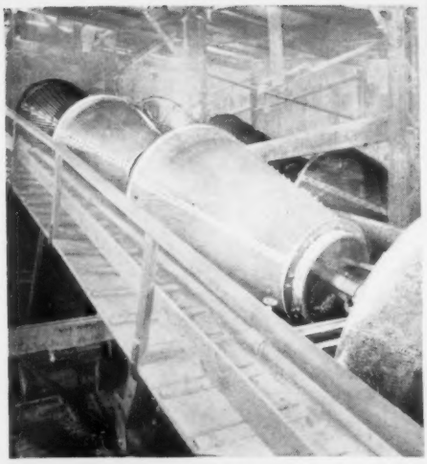

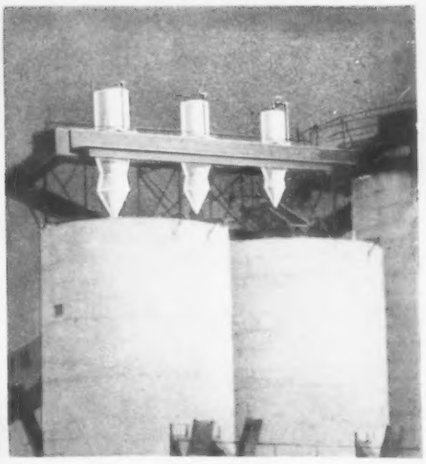

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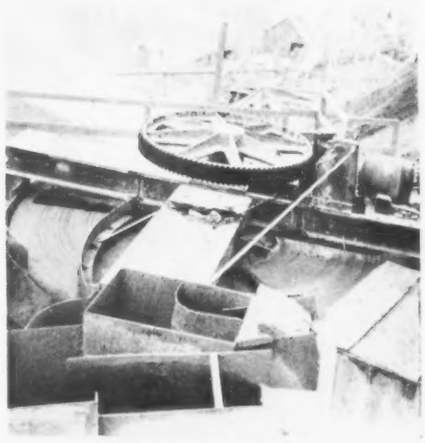

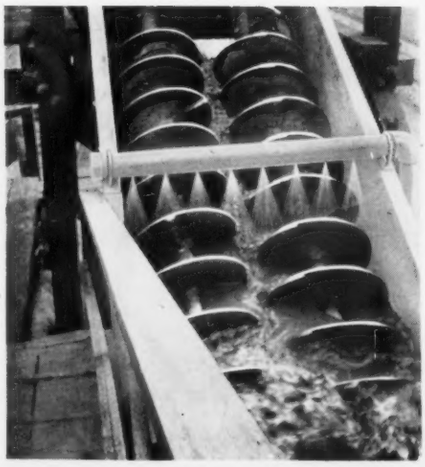

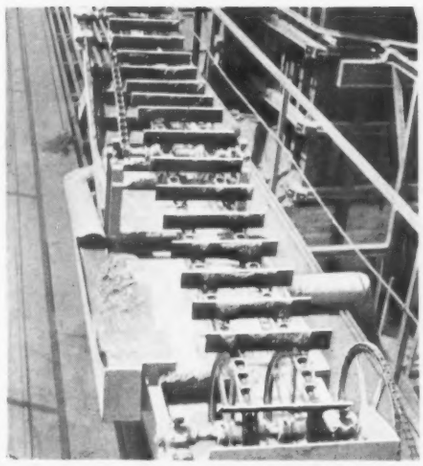

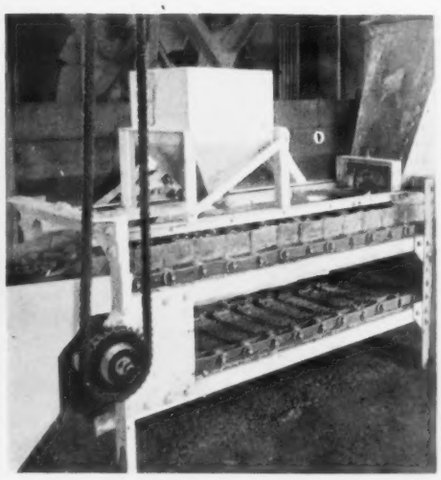

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SEP 28 1936

Pit and Quarry

With which is consolidated CEMENT-MILL & QUARRY

Volume 28 June, 1936 Number 12

MEMBER AUDIT BUREAU OF CIRCULATIONS

Published on the tenth of each month for producers and manufacturers of Cement, Crushed Stone, Gypsum, Lime, Sand, Gravel and other nonmetallic minerals. Entered as second-class matter November 28, 1932, at the Postoffice at Chicago, Ill., under the Act of March 3, 1897.

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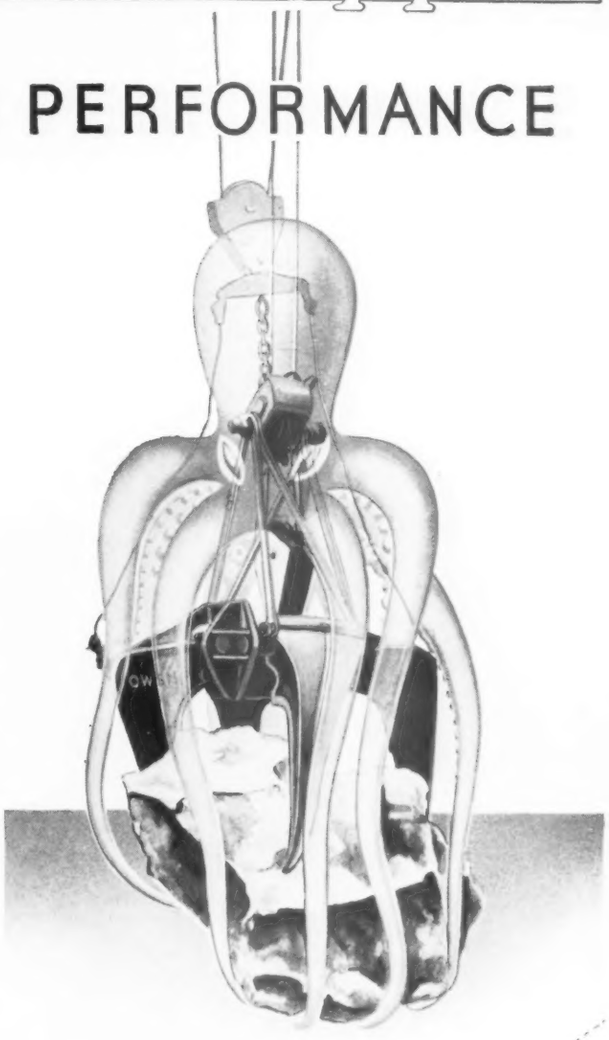
Announcing THE NEW Owen Grapple

revolutionary in PRINCIPLE and PERFORMANCE



THIS NEW OWEN GRAPPLE has 4 independently operating tines each of which firmly grasps the rock, regardless of its shape.

Like an octopus, it *cunningly entwines its victim —exerts super-human strength* and *clings with inescapable tenacity.*

Numbers of these grapples have already proved their exceptional ability in *easier handling, increased capacity* and *greater safety of operation.*

Read our new illustrated, descriptive bulletin and you will clearly understand why this new grapple measures up to Owen standards which demand "a bigger days work."

Mail the coupon for grapple literature or folder describing the advanced line of Owen Buckets which now assure an even larger "MOUTHFUL AT EVERY BITE."

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Familiarize yourself with the 1936 line of Owen Buckets which includes new models—improved design—added refinements.

MAIL THE COUPON

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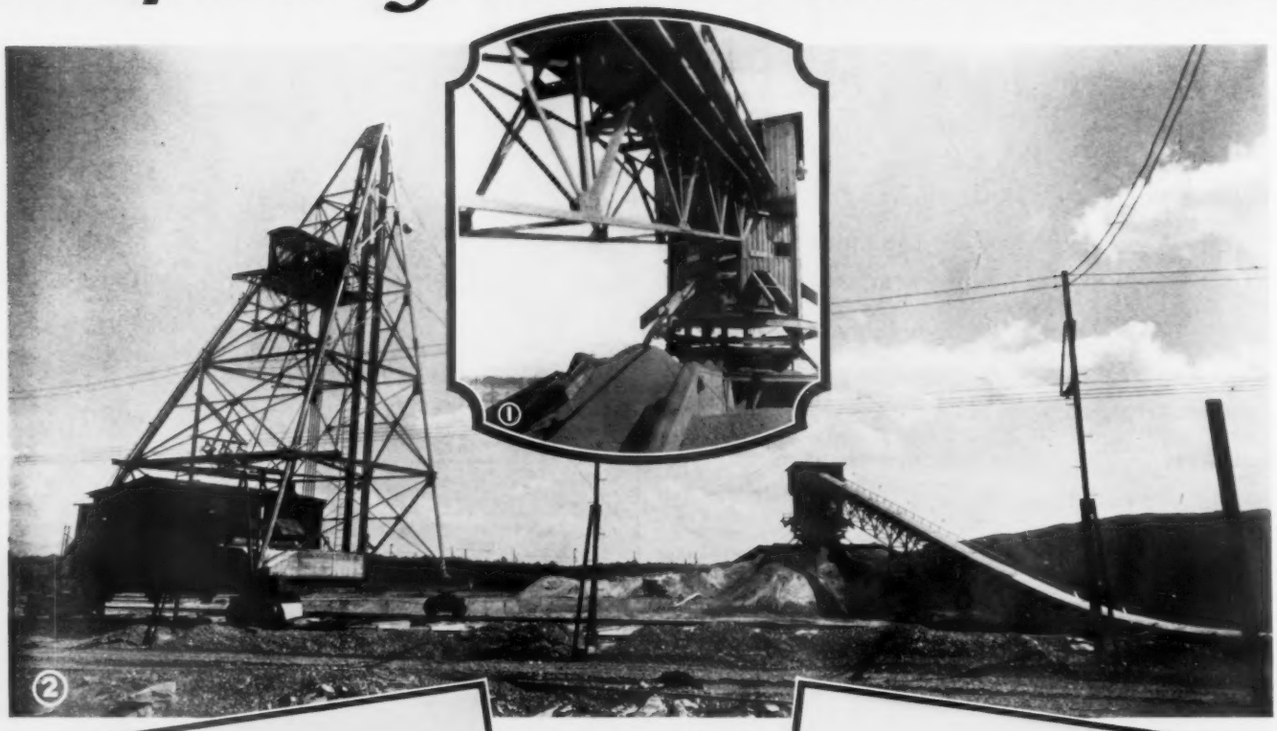
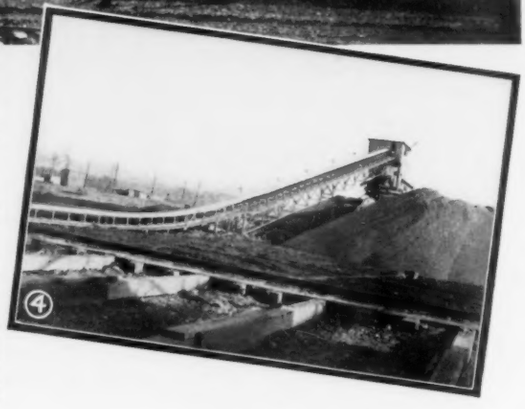
KERN *Storage Efficiency adopted by* TVA *at* PICKWICK DAM





1. Close-up of Kern Storage System showing sand being discharged through spout to live storage and being dragged to dead storage by 2½ cu.yd. scraper.
2. Kern system with movable traveling hoist tower in left foreground.
3. Radial Storage System (right). Traveling drag scraper hoist tower (left).
4. Storage system showing one compartment with some material in storage and conveyor bringing material from loading dock to storage.

Like other KERN installations, this system permits the storing of large quantities of sand and aggregates in advance of concreting operations and forestalls delays occasioned by any unavoidable breakdown in delivery of materials. It promotes both efficiency and economy.

The material is delivered graded, by barge, thence by conveyor to the KERN Storage Tower which distributes it to the desired compartments by means of the revolving spout discharge through separate chutes to each compartment.

Aggregates are then reclaimed through separate gates from each compartment to an arrangement of mixing chutes, which discharge to a belt conveyor operating in a tunnel.

The live storage capacity of each of the six compartments is 500 tons, having a total storage capacity approximating 3,000 tons for each of three grades of sand and three grades of aggregates. Blends are made possible at the plant if so desired.

KERN Systems are pointing the way to new efficiency and low storage cost wherever installed. We shall gladly assist you in lowering your handling and producing costs, enabling you to operate continuously regardless of demands.

Storage analysis plans submitted on request

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REDUCE YOUR TRUCK EXPENSE

Initial Cost —35 to 50% Less
Operating Cost—50 to 60% Less

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Write for Complete Details

U. S. PATENT 1897153—OTHER PATENTS PENDING

THORNTON TANDEM COMPANY

Detroit, Michigan, U. S. A.

Modern science of blending soils opens new field to AGGREGATE PRODUCERS

MANY a gravel pit, quarry and brickyard is going to pour out ready-mixed, ready-to-apply stabilized road surfacing. Nineteen thirty-six is the year for building secondary roads, and stabilized mix is the material most needed.

Soil scientists have discovered, and highway engineers have applied to road building, the properties of cohesion, friction, endurance, and firmness. Certain soils possess and retain their desirable properties when mixed with moisture regulating Calcium Chloride and provide a stabilized road at very low cost.

Fortunately, most of the needed soils are available in or near regular pits and quarries. Much of the bulk consists of overburden soils and finer aggregates, often unsalable in commercial work except as "fill" dirt. Much of the equipment necessary for testing, grading, proportioning and mixing is already in the pits and quarries.

So it costs aggregate producers very little to get into this profitable business of supplying "stabilized soil mix." Bulletin number 24 tells how. Write for it today.

Above—A typical Michigan stabilized road.

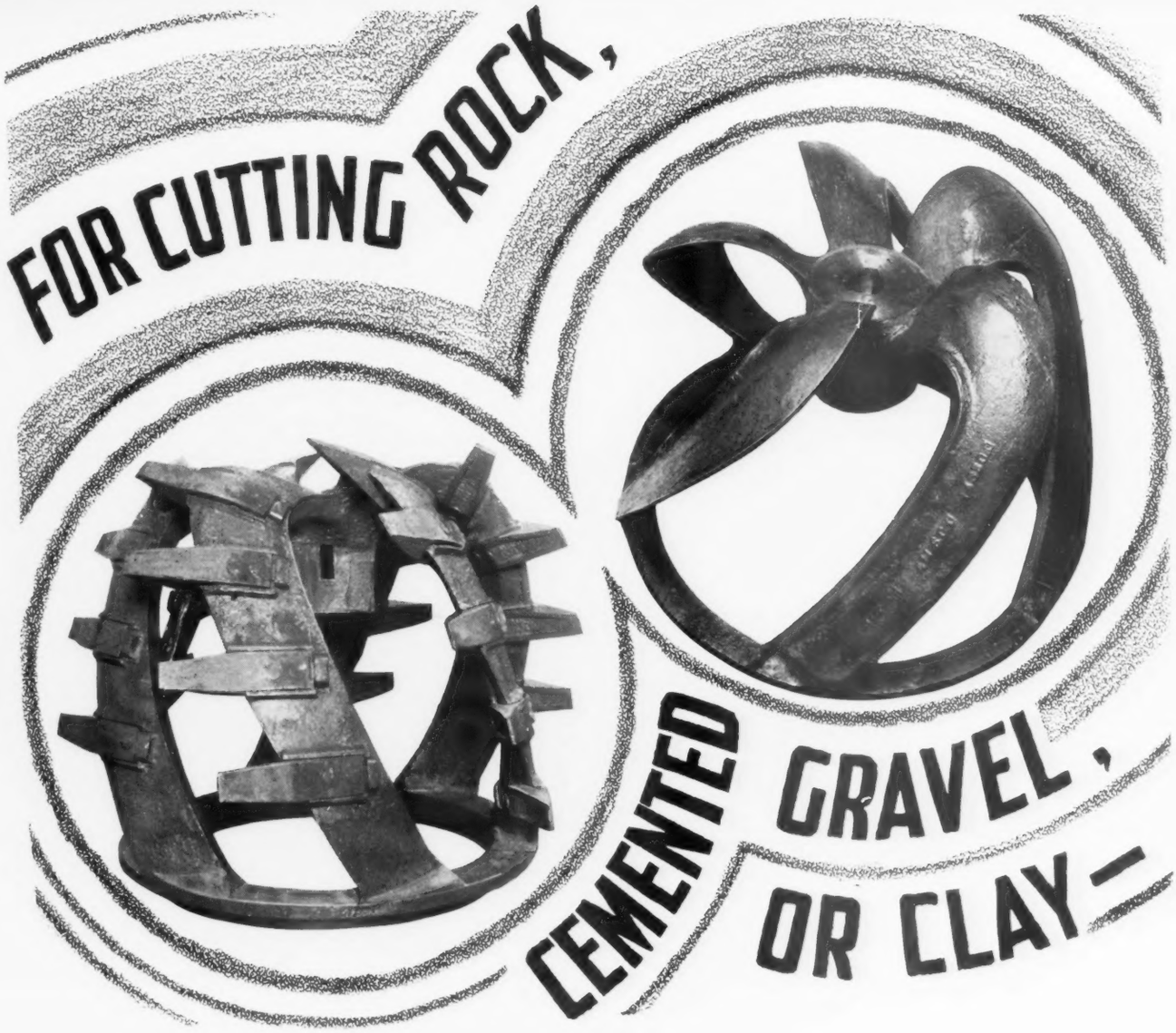
Left—Pit operations using clay overburden, at New Hudson, Michigan.

Below—Sandwich Fairgrounds stabilized road De Kalb County, Ill.

Calcium Chloride Association

Michigan Alkali Company, 60 E. 42nd St., New York City
Solvay Sales Corporation, 40 Rector St., New York City
The Columbia Alkali Corporation · Barberton, Ohio
The Dow Chemical Company Midland, Michigan

CALCIUM CHLORIDE
FOR STABILIZING ROAD SURFACES



AMSCO MANGANESE STEEL CUTTER HEADS!

AMSCO Manganese Steel Cutter Heads are made in designs to suit every dredging condition and, though our efforts are confined to the making of the Manganese Steel Castings, we are glad to offer design suggestions based on our years of experience with hundreds of installations in the field.

Whether you need a clay or mud cutter; a rock, cemented gravel or hard pan cutter; a plain basket type or heavy-duty toothed cutter; the broad experience of AMSCO engineers will help you. And the assured longer service life of Cutter Heads made of AMSCO Manganese Steel will minimize your labor and maintenance costs, while increasing your production — and productive working hours.

AMSCO Manganese Steel, "the toughest steel known," is ideally applied in Cutter Heads, Pumps, and other dredge equipment where its unusual wear and impact resistance many times returns its cost in long-time, trouble-free operation.

May we figure on your Dredge Cutter Head needs? A copy of a new Cutter Head Bulletin No. P-8, sent to you free on request, will facilitate your getting a correct and prompt quotation. Send for a copy!

AMERICAN MANGANESE STEEL COMPANY
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Foundries at Chicago Heights, Ill.; New Castle, Del.; Denver, Colo.; Oakland, Calif.; Los Angeles, Calif. • Offices in Principal Cities

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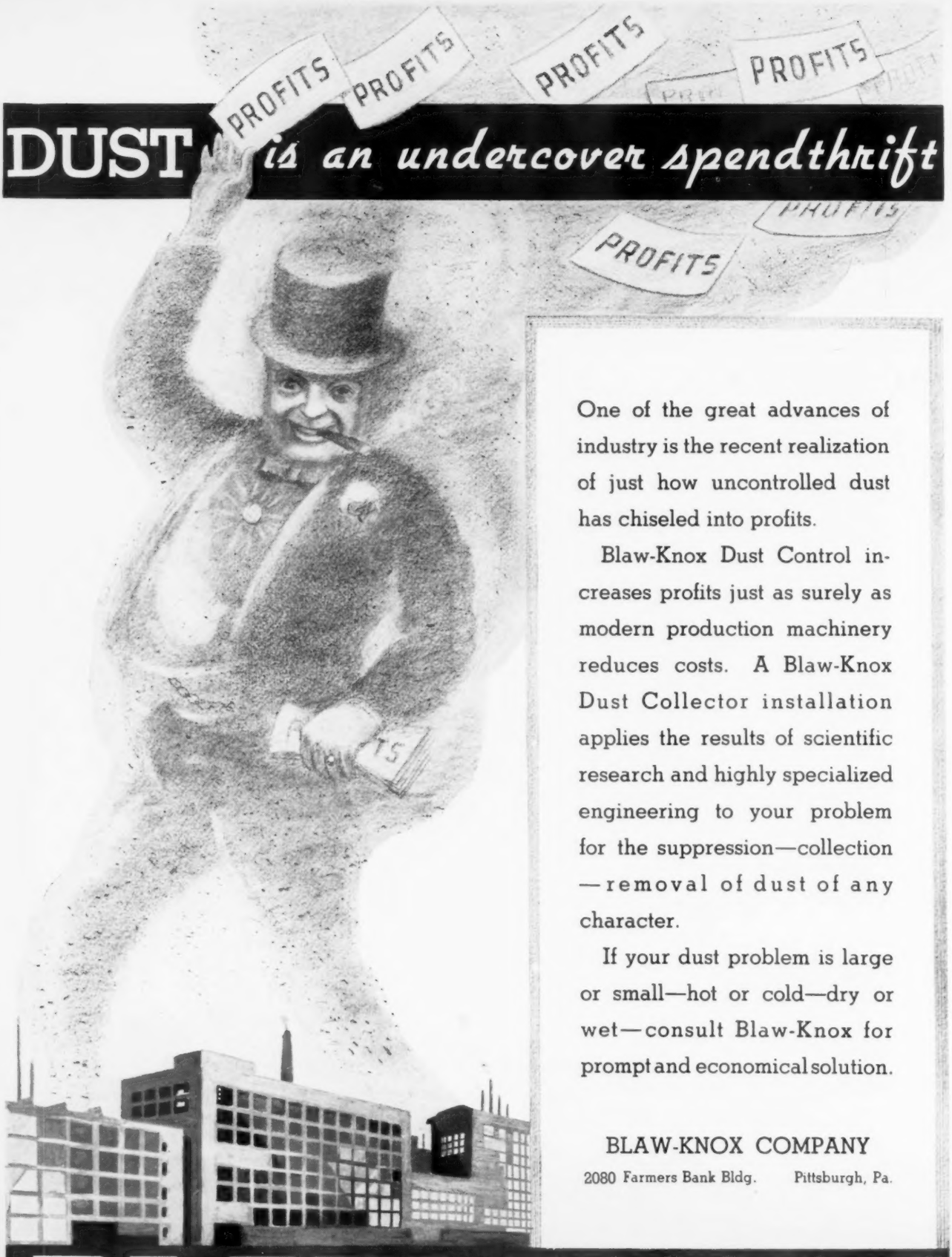
TRADE MARK REGISTERED

DUST is an undercover spendthrift



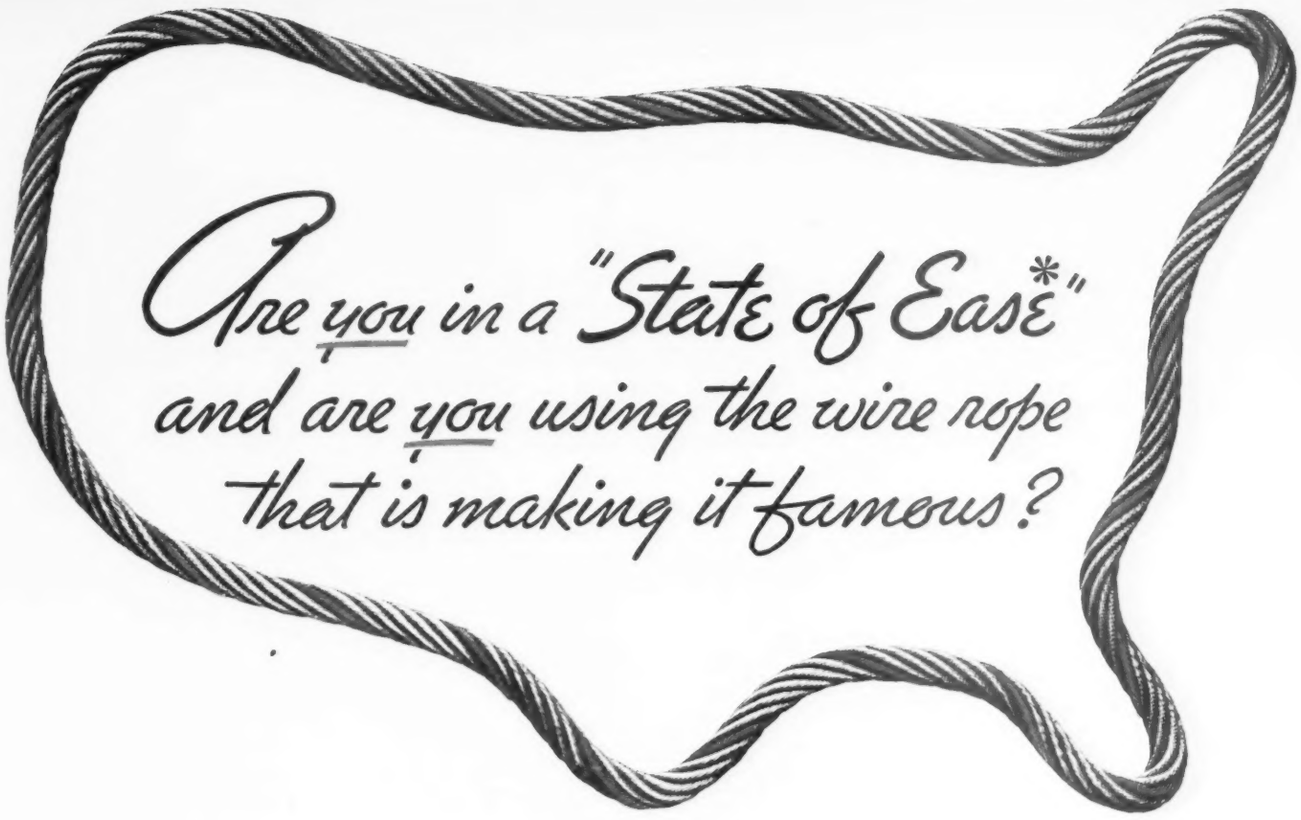
One of the great advances of industry is the recent realization of just how uncontrolled dust has chiseled into profits.

Blaw-Knox Dust Control increases profits just as surely as modern production machinery reduces costs. A Blaw-Knox Dust Collector installation applies the results of scientific research and highly specialized engineering to your problem for the suppression—collection—removal of dust of any character.

If your dust problem is large or small—hot or cold—dry or wet—consult Blaw-Knox for prompt and economical solution.

BLAW-KNOX COMPANY
2080 Farmers Bank Bldg. Pittsburgh, Pa.

BLAW-KNOX
DUST CONTROL SYSTEMS FOR INDUSTRY



* The term "State of Ease" is taken from Slocum and Hancock's book "Strength of Materials" which quotes Prof. Karl Pearson: "A body which is free from internal stress is said to be in a STATE OF EASE."

ARE you, as a wire rope user, in a "state of ease"? Are you easy in mind—sure you are getting all that wire rope should give you? Are you using the wire rope that is "free from internal stress"?

TRU-LAY Wire Rope *is* in a "state of ease" because it is preformed. Every wire and strand is free from the unnecessary internal stresses that promote early metallic fatigue.

TRU-LAY has the flexibility that permits bending over sheaves and drums for much longer periods. It has the balanced construction that distributes the load equally to each strand and wire. It offers positive resistance to the kinking, the twisting in sheaves, the poor spooling and other erratic actions that shorten the rope life and pile up needless rope costs. It assures that when outer wires finally wear through they will not stand out to injure men and equipment.

All because every wire and strand in a TRU-LAY Preformed Wire Rope is truly in a STATE OF EASE.

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Wilkes-Barre, Pennsylvania
An Associate Company of the American Chain Company, Inc.
In Business for Your Safety

GREEN SIGNIFIES SAFETY

District Offices: Atlanta, Chicago, Detroit, Denver, New York, Philadelphia, Pittsburgh, Houston, San Francisco

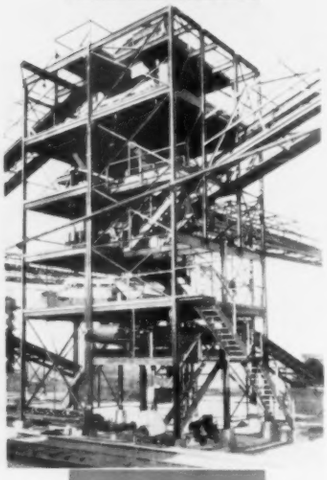
TRU·LAY *Preformed* Wire Rope

ALL AMERICAN CABLE COMPANY ROPES MADE OF IMPROVED PLOW STEEL ARE IDENTIFIED BY THE EMERALD STRAND

S 10 Y 4 M S C R

10 SYMONS SCREENS At Boulder Dam

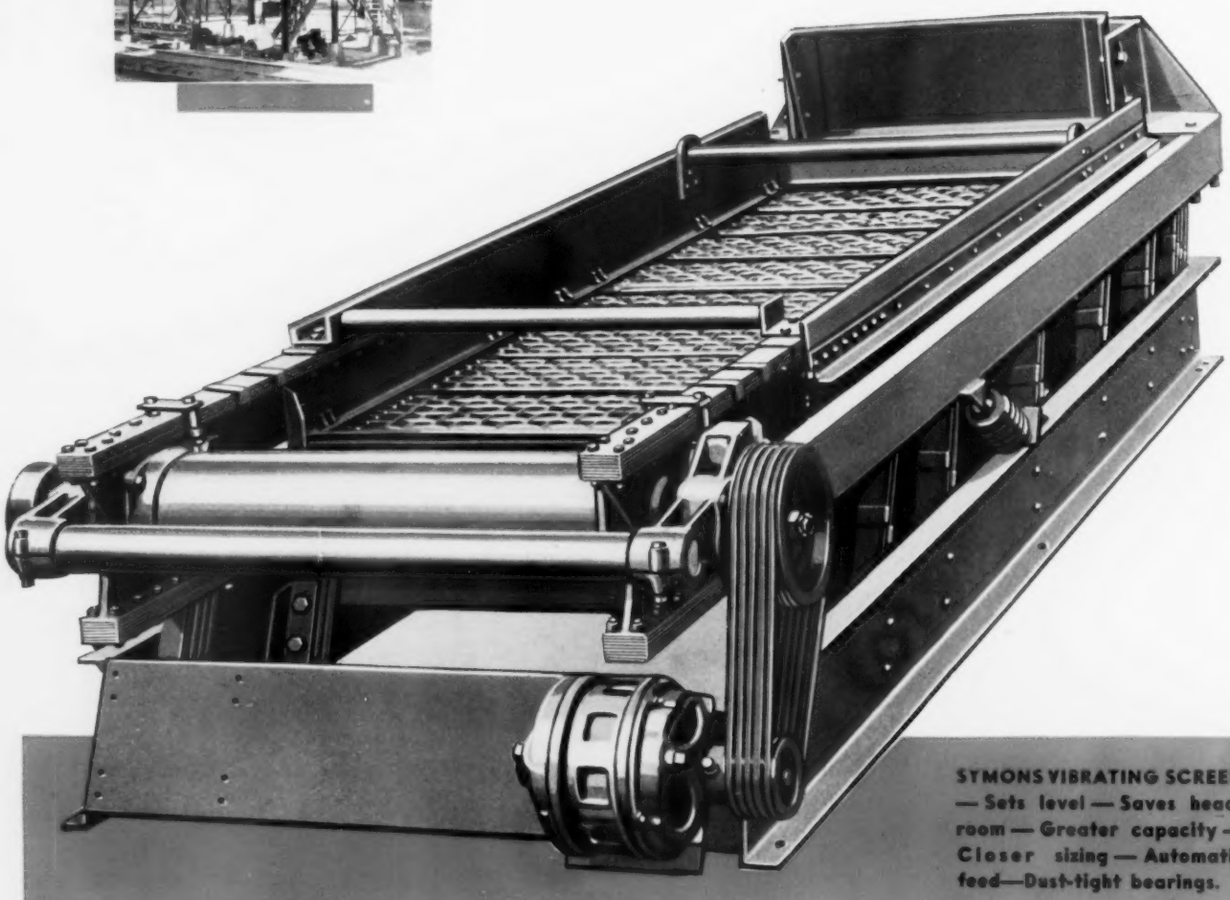
handling sand and gravel at plant capacity of 500 tons per hour.



4 SYMONS SCREENS At T. V. A. Norris Dam

handling crushed stone and stone sand. Total capacity 400 tons per hour.

FINE-- COARSE Materials



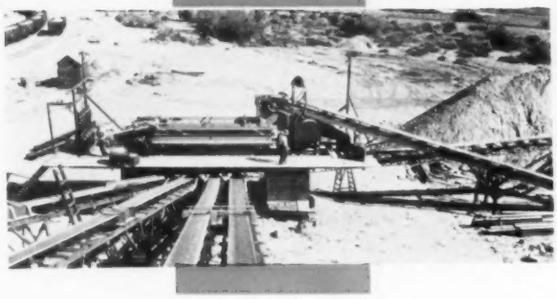
SYMONS VIBRATING SCREEN — Sets level — Saves headroom — Greater capacity — Closer sizing — Automatic feed—Dust-tight bearings.

SYMONS SCREENS

SMALL--LARGE Plants

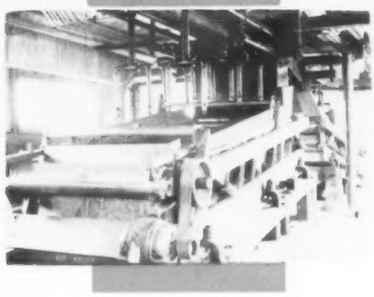
46 SYMONS SCREENS At Colorado River

Aqueduct, operating in 26 different plants, and screening out excess fines dry as no water available.



12 SYMONS SCREENS At Grand Coulee

Dam are handling 1000 tons per hour of washed and graded aggregate. Photo shows two of the four 5-ft. by 10-ft. coarse-sizing screens with V-belt drive, located in one of the screening plants.



For All Classes of Screening

IN these major installations, ranging from the smallest to the largest plants, every conceivable operating condition is successfully met by Symons Screens. The material handled runs all the way from boulders to extremely fine sand. The screening is done on both wet and dry products. There are wide variations in feed and in the hardness of the materials screened.

SYMONS BROS. DEVELOPMENT CO.

1462 North Stanley Ave., Hollywood, Calif.

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12,500 NAMES

IN YOUR

SALES

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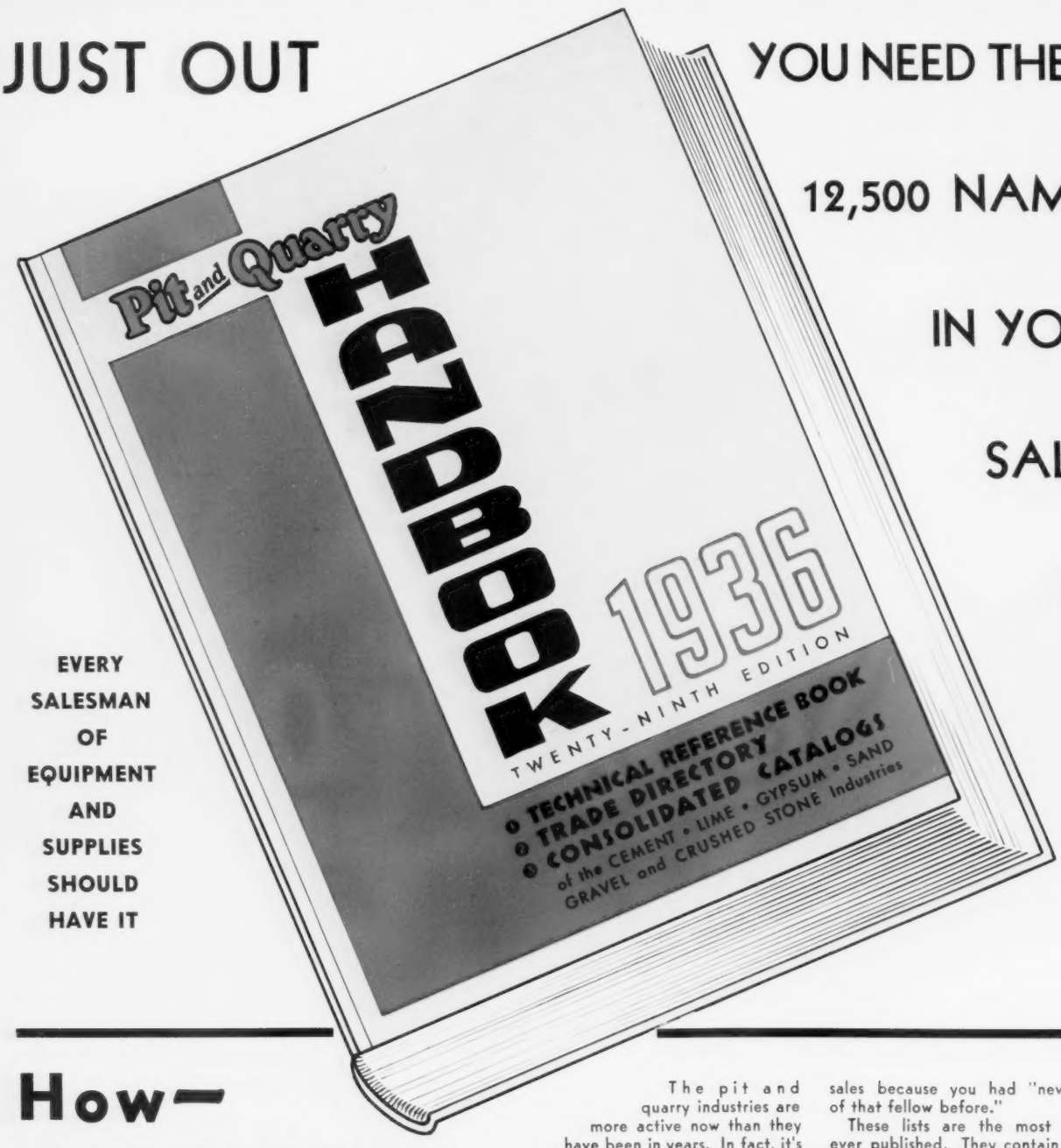

EVERY SALESMAN OF EQUIPMENT AND SUPPLIES SHOULD HAVE IT

How—

—accurate and complete are your prospect lists?
—accurate on individual names of Supt. and Officers?
—much "deadwood" is there on your prospect lists?
—much do you waste per year on poor lists?
—many "not there" calls do your men make?
—much do you know about new developments?

The pit and quarry industries are more active now than they have been in years. In fact, it's one of the most active fields in industry. It's natural. For before the roads, dams, bridges, buildings, etc., can be built under the public works program the raw material has to be furnished.

Get your share of it. Don't miss fire with poor prospect lists. Don't lose sales because you had "never heard of that fellow before."

These lists are the most complete ever published. They contain hundreds of new names. They have been completely revised—all listings have been brought up to the minute.

Regardless of whether your territory covers only one state or the whole country the investment in a copy of Pit and Quarry Handbook is something that will pay big dividends—in sales.

To Delay Is to Lose Sales—The Field Is Active—It Is Buying

PIT AND QUARRY, 538 S. Clark St., Chicago, Ill.

☐ Send ..... copies of the 1936 Pit and Quarry Handbook and Directory ($10.00 per copy).

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My Name ..... Title .....

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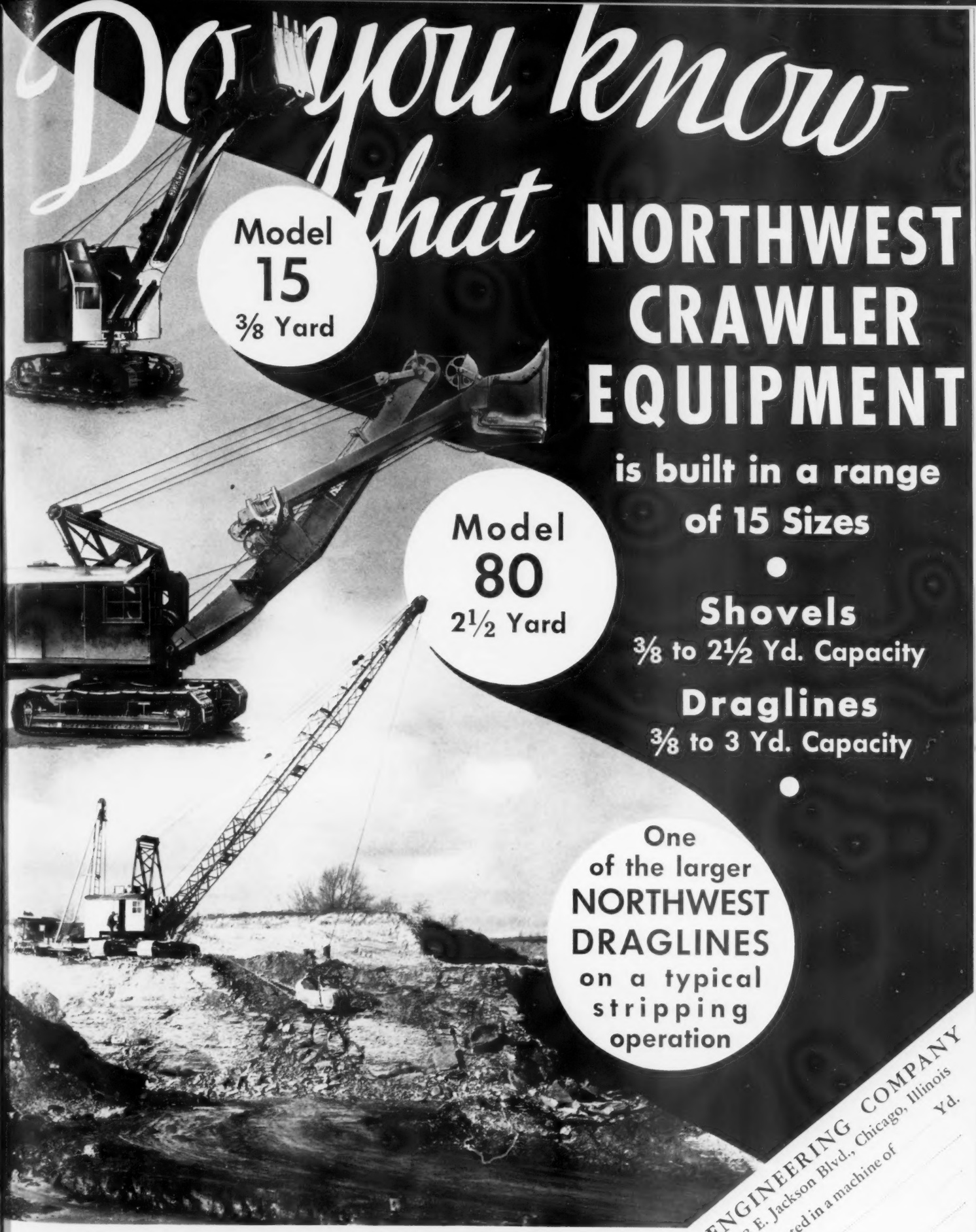
Do you know that



Model 15
3/8 Yard

Model 80
2 1/2 Yard

NORTHWEST CRAWLER EQUIPMENT

is built in a range of 15 Sizes

•

Shovels
3/8 to 2 1/2 Yd. Capacity

Draglines
3/8 to 3 Yd. Capacity

•

One of the larger NORTHWEST DRAGLINES on a typical stripping operation

NORTHWEST

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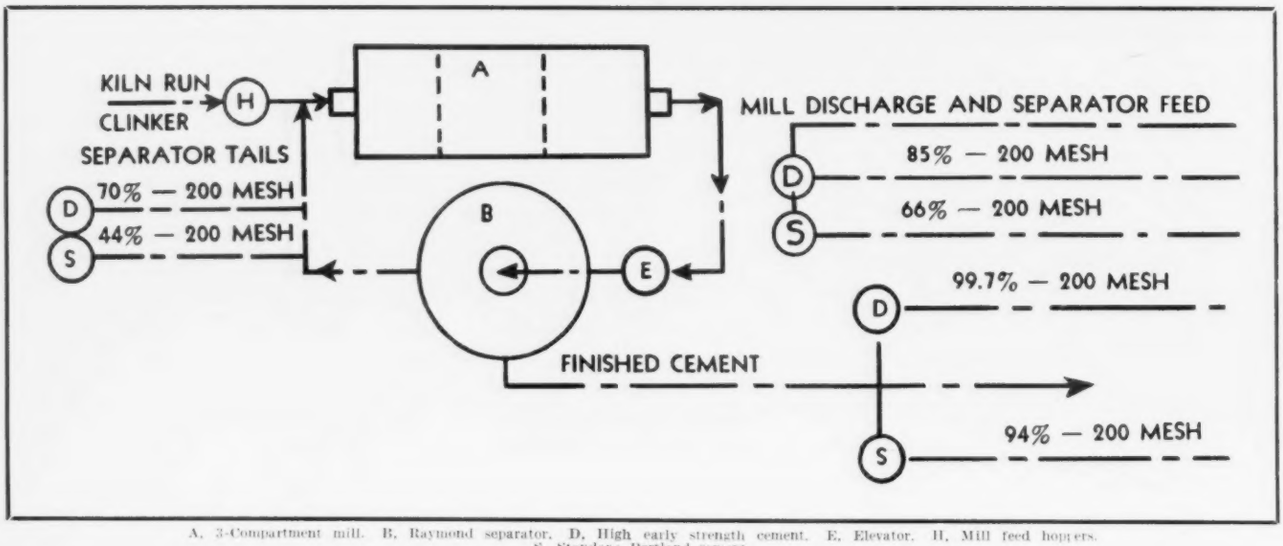
Gentlemen: We are interested in a machine of ..... Yd.
Capacity for .....

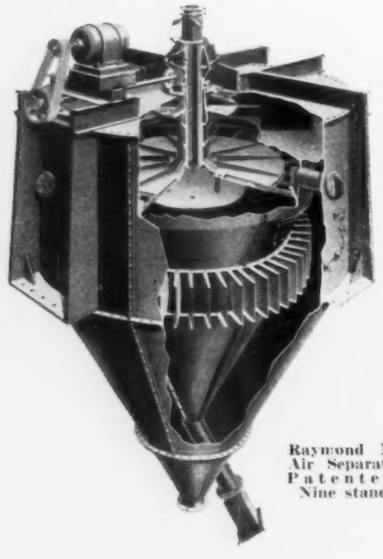
Name .....
Address .....
Town .....
State .....

Another RAYMOND Record in Separating CEMENT



A, 3-Compartment mill. B, Raymond separator. D, High early strength cement. E, Elevator. H, Mill feed hoppers. S, Standard Portland cement.

44% More Capacity—20% Less Power



Raymond Mechanical Air Separator with Patented Whizzer. Nine standard sizes

THE superior results, being obtained in cement plants with Whizzer-type Mechanical Air Separators, are shown by these operating figures taken at random from a typical installation among the many Raymond units used by leading manufacturers of both standard Portland and high early strength cement.

The equipment includes a 16′ Raymond Separator in closed circuit with a 7′x45′ three-compartment mill.

	Open (Std)	Closed (Std)	Closed (H. E. S.)
Total Capacity	90 bbl/hr	130 bbl/hr	85 bbl/hr
Finished Fineness	88%—200 mesh	94%—200 mesh	99.7%—200 mesh
Flour Content	51%—30 microns	54%—30 microns	.....
Power per Barrel	6.28 KW	4.99 KW	7.58 KW
	No Separator	With Separator	With Separator

Note that the total output is increased 44% by the use of the Raymond Whizzer Separator in making the Standard Portland Cement, also the better quality shown by the higher fineness and micron count.

For performance records on other installations, see No. 24 Separator Bulletin—copy sent on request.

RAYMOND BROS. IMPACT PULVERIZER CO.

Division of Combustion Engineering Company, Inc.
1321 North Branch Street, Chicago
Sales Offices in all Principal Cities
Canadian Repr.: Combustion Engineering Corporation, Ltd., Montreal

Maximum Recovery of Fines—High "Flour" Content

New Williams-equipped Fine Grinding TALC PLANT

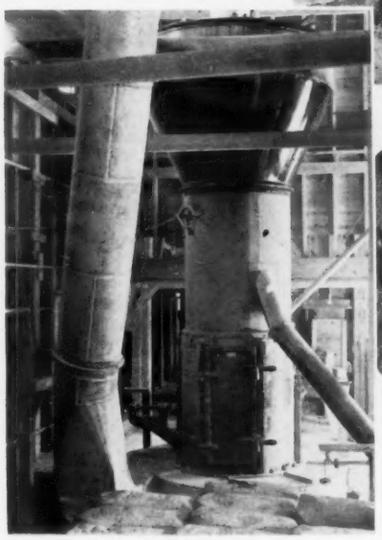
Southern Talc Company plant with raw talc storage building shown at the left.

Advantages that go with WILLIAMS Roller Mills:

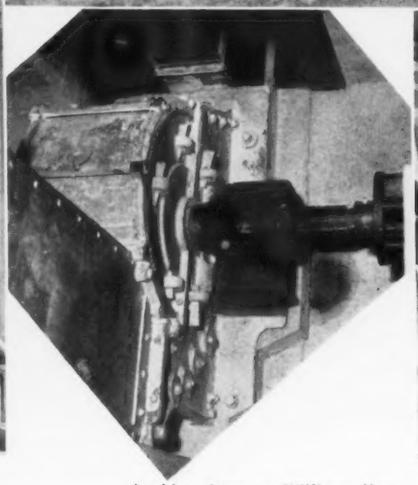
(1) Ball Bearing Operation Throughout

(2) Steel, not cast iron, Castings at important points

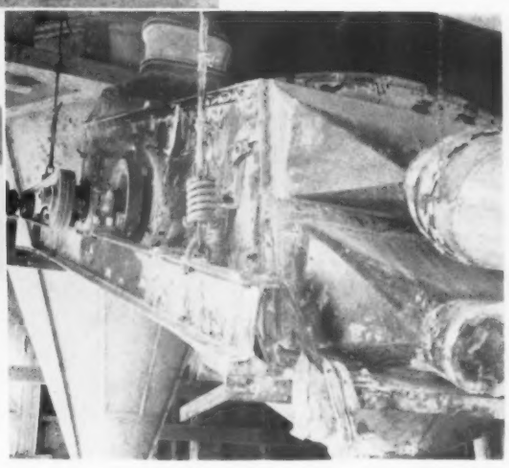
(3) Instantly Changeable from 70% minus 100-mesh to 99.99% minus 325-mesh



Williams 4-roll Roller Mill with Air Separator. For grinding to 99% through 325-mesh.



Looking down on Williams Hammer Mill which reduces raw talc to ½" minus size.



Williams 4 x 10 ft. double-deck Vibrating Screen. For production of roofing granules.

THE newly completed plant of the Southern Talc Company at Chatsworth, Georgia, typifies the best modern practice in processing ground talc, and the equipment represents the maximum of efficiency in reduction methods.

The plant is extremely flexible to permit making any commercial grade in demand. Extreme accuracy is also an outstanding feature. Williams supplied all of the major equipment including a Hammer Type Primary Crusher to break the mine run talc for the fine grinder, a Roller Mill with Air Separator which grinds as fine as 99% 325 mesh and a Vibrating Screen for making roofing granules.

If you have a reduction problem, either coarse crushing, fine grinding or a complete plant, let Williams engineers tell you about the proper equipment for the job.

Williams Patent Crusher & Pulverizer Co.

802 St. Louis Avenue, St. Louis, Missouri

Chicago	New York	San Francisco
37 West Van Buren St.	15 Park Row	326 Rialto Bldg.

THE WILLIAMS PATENT CRUSHER & PULVERIZER CO. ST LOUIS MO USA — TRADE MARK — REG U.S. PAT OFF

Williams

OLDEST AND LARGEST BUILDERS OF HAMMERMILLS IN THE WORLD

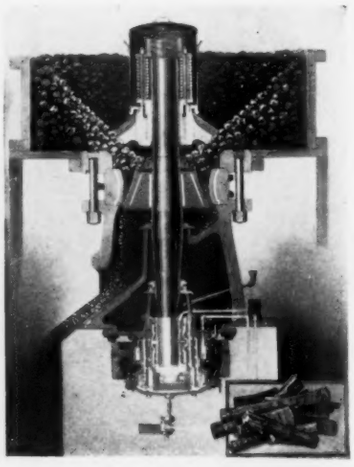
WILLIAMS

PATENT CRUSHERS GRINDERS SHREDDERS

Operating figures prove the economy of these Power Savers

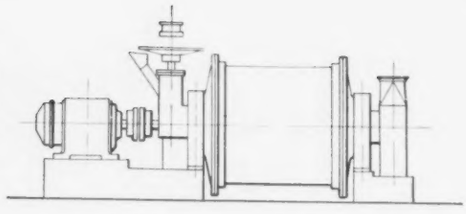
Kennedy Crushers and Screens are showing spectacular results in the production of aggregates under the hardest working conditions, in some cases doubling capacity and reducing power costs by half. The performance of this Ball Bearing Gearless Gyratory Crusher, for example, is attracting the attention of producers throughout the world. Comparative figures show actual savings of 50% in power consumption and 80% in maintenance cost.

Ask for details of this super-crushing unit.



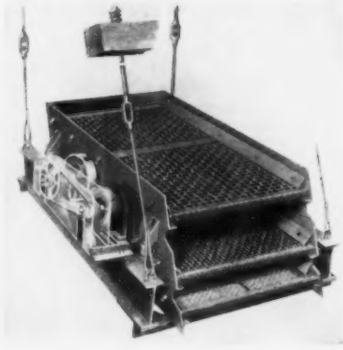
Kennedy Ball Bearing Gearless Gyratory Crusher

Kennedy Gearless Tube Mill



Highly efficient for grinding limestone, minerals and similar materials, also for pulverizing coal in firing kilns and boilers. Details sent on request.

Kennedy Vibrating Screen

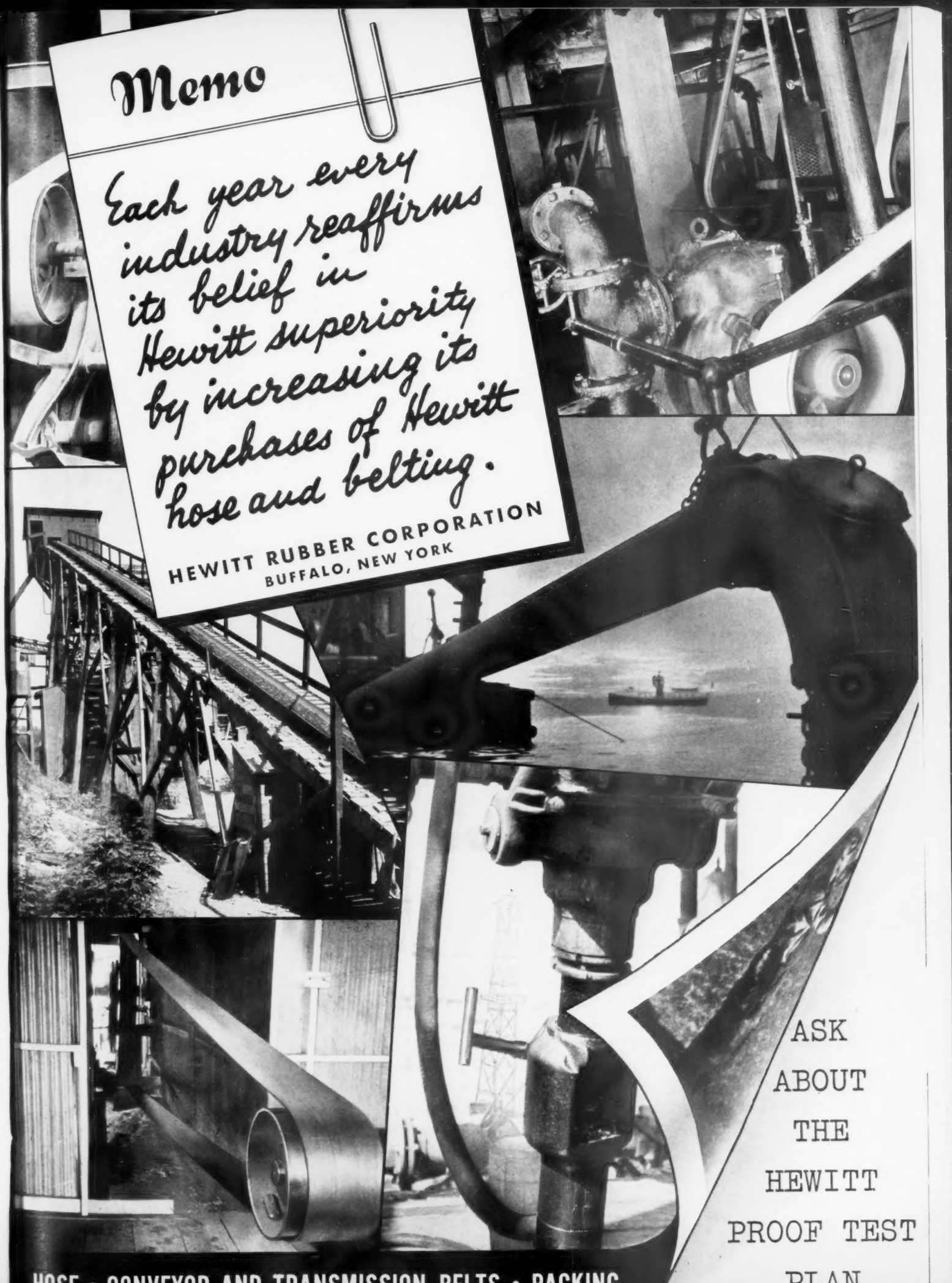


Does great work in scalping oversize from primary crushers, also in grading smaller sizes. Built in open or enclosed type in widths of 18" to 72" and with one or more decks, for suspension or bottom support.

KENNEDY-VAN SAUN MFG. & ENG. CORP.

2 Park Avenue New York, N. Y.

Sales Agents in all Principal Cities of the United States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Each year every industry reaffirms its belief in Hewitt superiority by increasing its purchases of Hewitt hose and belting.
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BUFFALO, NEW YORK
ASK ABOUT THE HEWITT PROOF TEST PLAN
HOSE • CONVEYOR AND TRANSMISSION BELTS • PACKING

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Each new improvement, through the years, has further lowered your cost per ton of rock removed.

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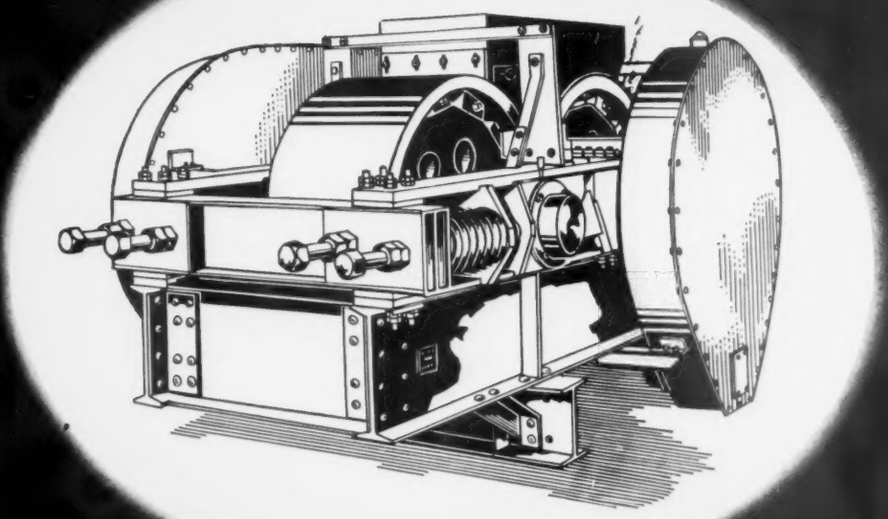

THE PIONEER ROLL CRUSHER

● When the term, QUALITY CONSTRUCTION is used in connection with PIONEER ROLL CRUSHERS it means that no restrictions have been placed on the cost of workmanship or materials. It means that every part has been specially designed, and only selected and tested steels used so that you can be sure of continued operation at full capacity—long life—and low maintenance costs.

● This new Booklet on "The Roll Crusher" and "Its Place in The Crushing Industry," contains valuable information for you. Mail the coupon today and get your copy.

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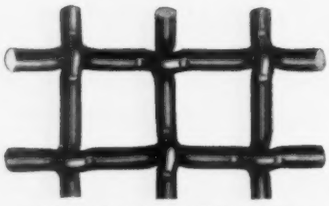
PIONEER GRAVEL EQUIPMENT MFG. CO.
1515 Central Ave., Minneapolis, Minn.

Gentlemen: Please send me your latest booklet on "The Roll Crusher."

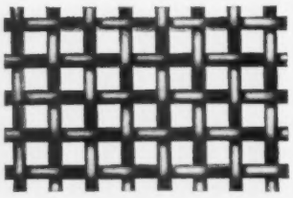
Name .....

City ..... State .....

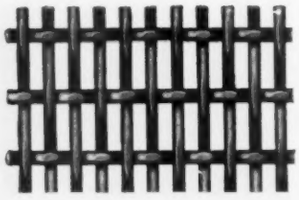
IS YOUR SCREEN PROBLEM A *TOUGH NUT* TO CRACK?



"HY-LO" Crimp Wire Screen



Square Mesh Wire Screen



Oblong Mesh Wire Screen

Efficiency? Resistance to vibration? Resistance to abrasion? What is your wire screen problem? We would like to help you lick it.

We offer you the benefit of 90 years of experience in making wire to withstand tough service conditions . . . the benefit of over a half century's experience in wire fabric production.

Roebling Wire Screens are available in many types and metals to meet a wide range of efficiency, vibration, and abrasion requirements.

JOHN A. ROEBLING'S SONS COMPANY
TRENTON, N. J. *Branches in Principal Cities*

ROEBLING *Wire Screen*

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90 YEARS OF WIRE MAKING SPELLS THE DIFFERENCE

The Machinery Supply Center

of Chicago
Sales Area

for Nationally
Known Makes

CONSTRUCTION, EXCAVATING AND DIRT MOVING EQUIPMENT

HEAVY DUTY DESIGNS

View of the New Showrooms
of the
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Representing America's Leading Equipment Builders

As authorized sales agents for a full line of Tractors, Shovels, Compressors and Road Building Machinery, we offer you experienced engineering service in selecting the proper equipment, and in efficiently adapting it to your needs.

Write for Bulletins describing any of the following lines of equipment:

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TRACTOR AND EQUIPMENT CO.

Construction, Excavating, Dirt Moving and Road Building Equipment

433 South Jefferson Street — Chicago, Illinois

The manufacturer of this side-mounted bullgrader specializes in equipment for a special job. International supplies the power that makes it work—a Diesel TracTracTor.

Bank on International Industrial Power to Handle the Tough Jobs

INTERNATIONAL HARVESTER'S long experience as a manufacturer of tractors and power units is the most reliable guide to follow when you need industrial power. To get the real lowdown on International Industrial Tractors and Power Units, trust the men who have put this equipment through its paces. Then you will have a good idea of what International Power can do on your jobs.

The International line includes TracTracTors, wheel tractors, and power units, with gasoline and Diesel engines. The power units range from 12 to over 100 h.p., and there are light-duty engines from 1½ to 5 h.p. For detailed information, call on the nearby Company-owned branch or authorized industrial dealer.

INTERNATIONAL HARVESTER COMPANY
(Incorporated)
606 So. Michigan Ave., Chicago, Illinois

At left: Two International Diesel Power Units operating portable crushing plants for W. C. Burns near Driggs, Idaho. Mr. Burns, prominent contractor of Idaho Falls, purchased these Diesel units because of their high combustion efficiency in the rarefied mountain air. The elevation at this point is 8000 feet.

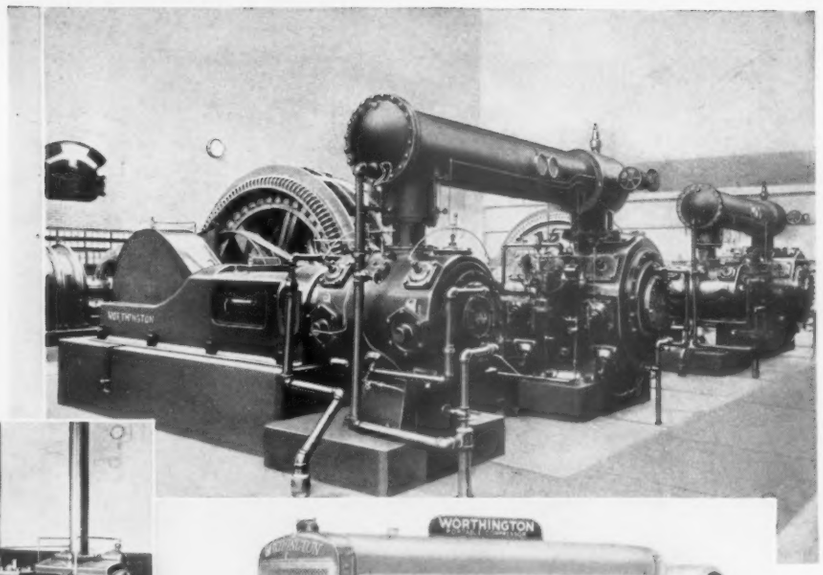
INTERNATIONAL HARVESTER

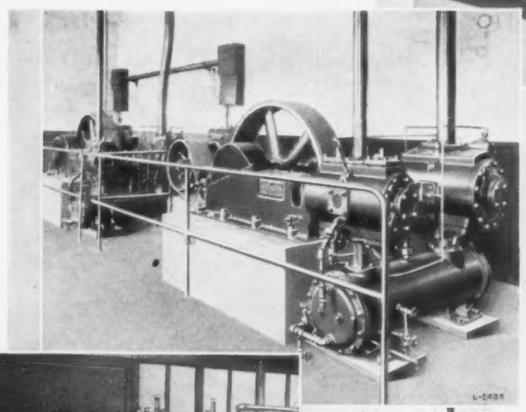
From

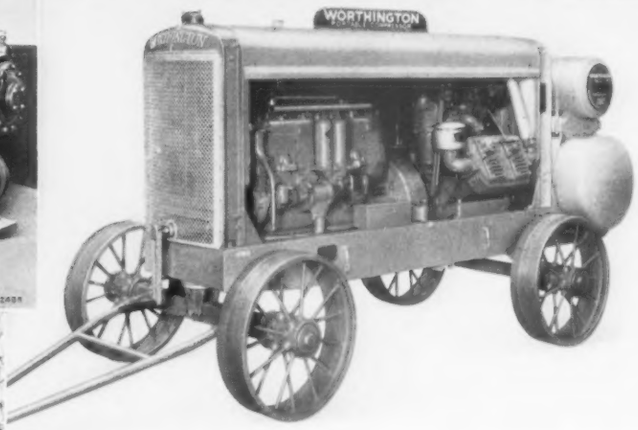
OPENING UP

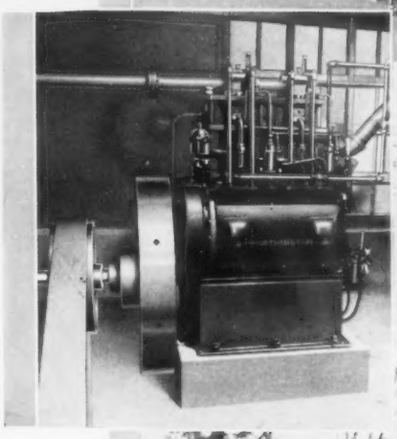
to

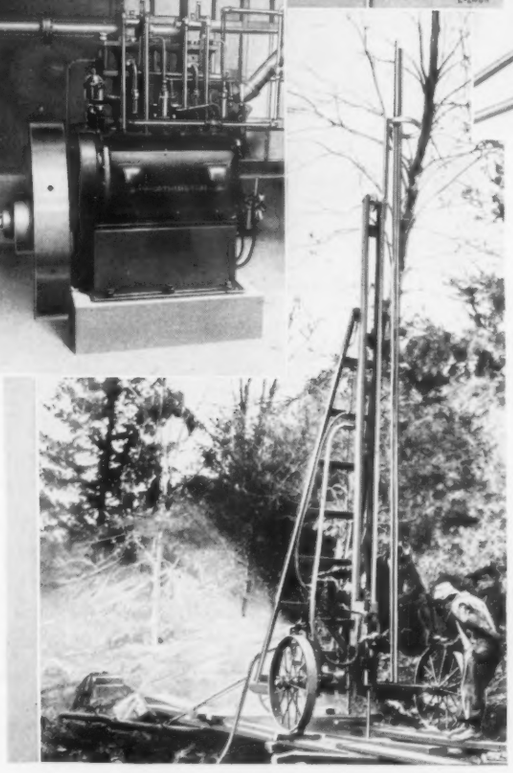
FULL OPERATION











STATIONARY COMPRESSORS

for permanent installation in operation of quarries and mills

PORTABLE COMPRESSORS

for preliminary work in opening up new quarries

DIESEL AND GAS ENGINES

for driving the crushing plant

WAGON DRILLS AND TRIPOD (DRIFTER) DRILLS

for snake holing and deep ledge work

ROCK HAMMERS

for boulder popping and shallow bench work

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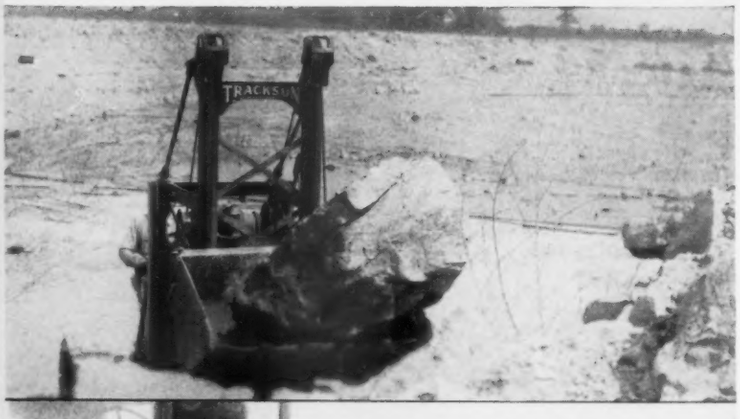
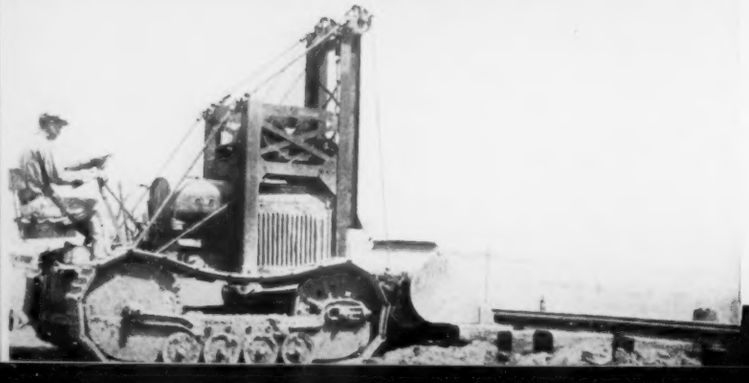
TRACKSON
HIGH SHOVEL

PROFIT PRODUCERS



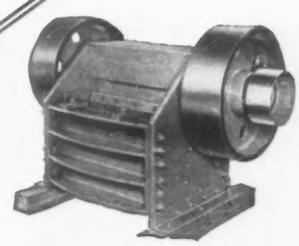


Trackson tractor shovels have a wide range of usefulness in Pits and Quarries and are built to stand the toughest jobs you can give them. Digging and loading; stripping; clean-up work; track shifting; charging conveyors, hoppers or crushers; loading cars, trucks and trailers; backfilling; reclaiming gravel from stream beds and loading from roadside pits are but a few of the jobs which can be done economically with the Trackson High Shovel and one man. They are easy to operate, fast and portable—low in first cost, considering yardage-producing ability—low in upkeep and economical to transport. We would like to tell you more about these "Profit Producers." Please write Trackson Co., Milwaukee, Wis., U. S. A.

GRUENDLER

EQUIPMENT

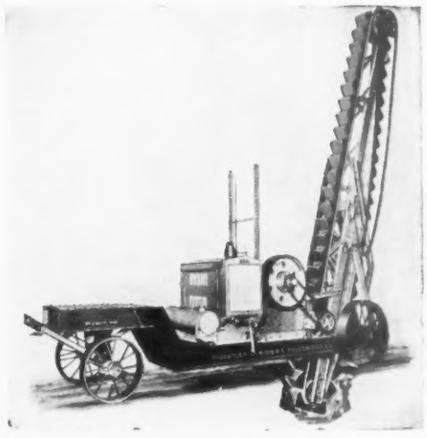
STANDS THE TEST OF TIME AND SERVICE



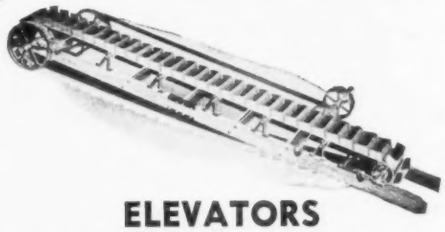
ROLLER BEARING JAW CRUSHER

Saves 90% in lubrication costs and insures minimum all 'round maintenance. "One Reduction" crushing means lower cost production. Sizes 9" by 14" to 24" by 36".

PORTABLE PLANTS

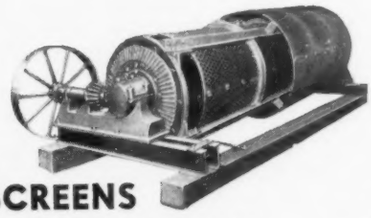


Also semi-portable and stationary units for crushing, screening and conveying in capacities from 100 to 4000 tons daily.



ELEVATORS

Both belt and chain types. Sturdily built with steel idler rollers and one-piece malleable steel buckets. Bucket sizes from 5" by 7¾" to 12" by 17¾".



SCREENS

Revolving type, heavy-duty for insuring maximum continuous output. Roller bearings. Revolving type sizes 8' base length 24" diameter to 48". Shaker type sizes 24" by 96" to 30" by 120".

Since 1885

For half a century, Gruendler has been building and improving a full line of crushers, screens, elevators and material handling equipment.

These perfected designs are the result of that long experience, and they combine the proven features developed in past years plus the latest mechanical refinements built into them by Gruendler engineers.

You will find it more profitable to use equipment that is backed by demonstrated performance—that's Gruendler.

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GRUENDLER CRUSHER & PULVERIZER COMPANY, 2915-17 N. Market St., St. Louis, Mo.

KIESLER CLAM SHELL BUCKETS

HAVE **REAL** DIGGING **POWER** PLUS **SPEED**

because . . . . . THE ONLY 2-LEVER-ARM BUCKET with direct penetrating and digging Power on both Shells. A fast, powerful Bucket that will increase your yardage, which means greater profits.

BUILT for performance with low up-keep expense.

WRITE FOR BULLETIN

JOS. F. KIESLER COMPANY

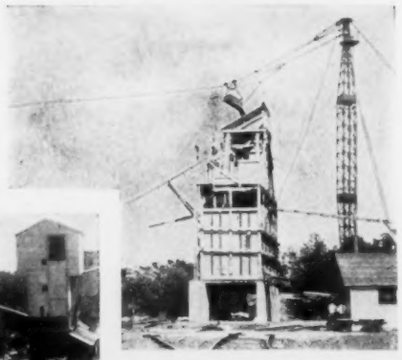
938 W. HURON ST. CHICAGO, ILL.

SAUERMAN LONG RANGE MACHINES

POWER DRAG SCRAPERS
SLACKLINE CABLEWAYS
SLACKLINE SCRAPERS

With a Sauerman machine you can dig and haul sand, gravel, crushed rock, ores, etc., any distance up to 1500 ft. for a few cents per cubic yard. Write for catalog showing money-saving ideas in digging from pit, bank or stream, stock-piling, stripping overburden, etc.

SAUERMAN BROS., Inc.
434 S. Clinton St., Chicago



the SEAL of APPROVAL
THOMPSON -STARRETT COMPANY INC.
LOS ANGELES, CALIF.
LIMA
Another LIMA swings into action on the Metropolitan Aqueduct project. It is digging and loading gravel on schedule 14 near the west portal of Hayfield tunnel. Equipped with a 60' boom and a 2 yard bucket it is performing in the same speedy and profitable manner that has won for LIMA the reputation of moving more material at less cost than any other machine on the market.
Thompson-Starrett Company, Inc., Los Angeles, contractors, who are the owners, have established themselves in the contracting field through expert supervision and careful selection of equipment for their work. Their approval of the LIMA proves again that contractors everywhere who hold to constant production and low cost, prefer LIMA shovels, draglines, and cranes.
follow the trend
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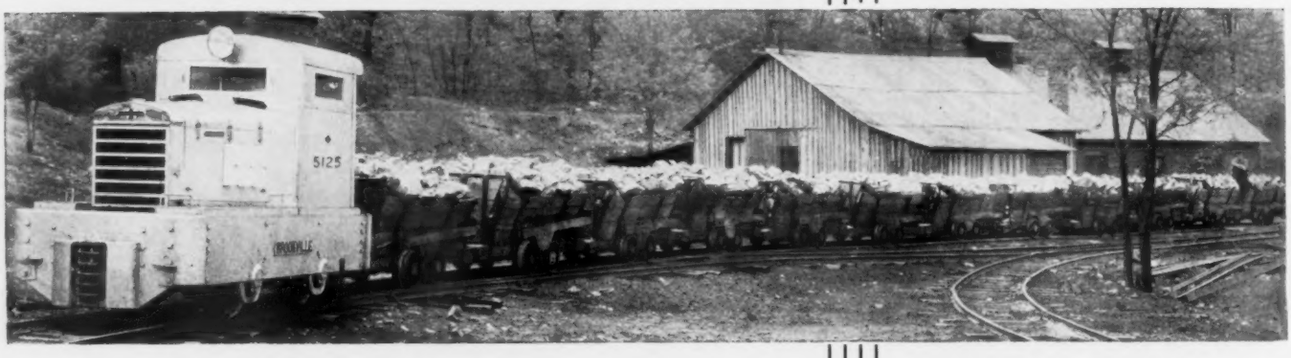
LIMAS ARE BUILT IN 3/ YARD CAPACITY LARGER

BROOKVILLE LOCOMOTIVES

Gasoline—Kerosene or Diesel Fuel



Brookville 12-ton Gasoline Locomotive in action. Steel cab with shatterproof glass windows.

Built for Long Service Life
Powered for Heavy Traction

ASK the men who use Brookvilles, day after day, to haul cars from pit, mine or quarry—and they will tell you that these sturdy engines "have everything"—stamina, speed, simplicity and ease of handling. They're strong on traction, and can pull amazingly large loads per ton of engine weight, even on poorly laid track, working at high efficiency under all conditions.

Their extra rugged construction, combined with "INTERNATIONAL" Power insures uninterrupted, trouble-free service for the hardest kind of jobs. Note, also, that the complete line of Brookville Locomotives makes it possible to select the proper type of engine for your requirements—from 2½ to 12 tons weight, in any gauge, with "INTERNATIONAL" (McCormick-Deering) both gasoline and Diesel. (Note) The smaller Brookville are also supplied with V-8 Ford power, and the larger with Caterpillar Diesel.

Typical 6-ton with "INTERNATIONAL" Diesel, a compact but powerful unit for heavy hauls.

Special Features

Brookville Steel Tires give 25% greater traction

Dual Spring Suspension permits higher speeds on poor track

All Forward Speeds are available in reverse

Indestructible Steel Frame

Rounded Steel Endsills

Four-wheel Drive

Any Size—Any Gauge

2½ to 12 Tons, built to any gauge, and powered with gasoline, kerosene or Diesel fuel.

FULL GUARANTEE

All Brookville parts are guaranteed for six months against failure from faulty materials, defective workmanship, and ordinary wear.

BROOKVILLE LOCOMOTIVE COMPANY | **Brookville, Penna.**

GENERALS HELP MAKE MISSISSIPPI NAVIGABLE

Spencer, White and Prentis, Inc. of New York City, are constructing a nine-foot channel for the U. S. Government, on the Mississippi River in Northern Minnesota, to make it commercially navigable. A large fleet of tractor-trucks are being used in the work and all are equipped with General Traction-tread Tires, because of their superiority in providing traction over rough, soft going. Photo by courtesy of W. L. Schultz, of the War Dept., U. S. Engineers Corp.

25 YARDS OF BULK CONCRETE!

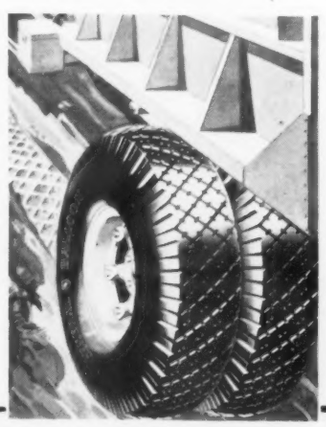
This truck carries the largest Diesel engine made for trucks—and the body holds 25 yards of bulk concrete. Triangle Rock and Gravel Company are using it in the construction of new water supplies for the City of Los Angeles. The construction job will use almost twice as much concrete as Boulder Dam. Triangle can't afford to have this job held up with tire trouble, so they put on 18 Generals.

THEY GIVE THE TOUGH JOBS to Generals··everywhere

FIND A JOB that's hard on tires—and you'll usually find Generals. That's because Generals have proved that they can "take it" where other tires fail.

If *your* job is tough there is a General Tire that will do it better at lower cost. Dependable Generals are proving this statement to skeptical "show me" operators every day.

Your General Tire dealer has a complete, highly specialized line of truck tires. He is a practical truck tire man with wide experience and accurate knowledge in fitting the right type and size of tire to every kind of job. This combination is worth real money to you. Call him in.



THE GENERAL HEAVY DUTY TRACTION BALLOON is made to order for the toughest construction jobs. It is only one of the complete line of Generals—each designed and built specifically to do a certain job better.

3 Reasons Why Generals Are More Profitable to You:

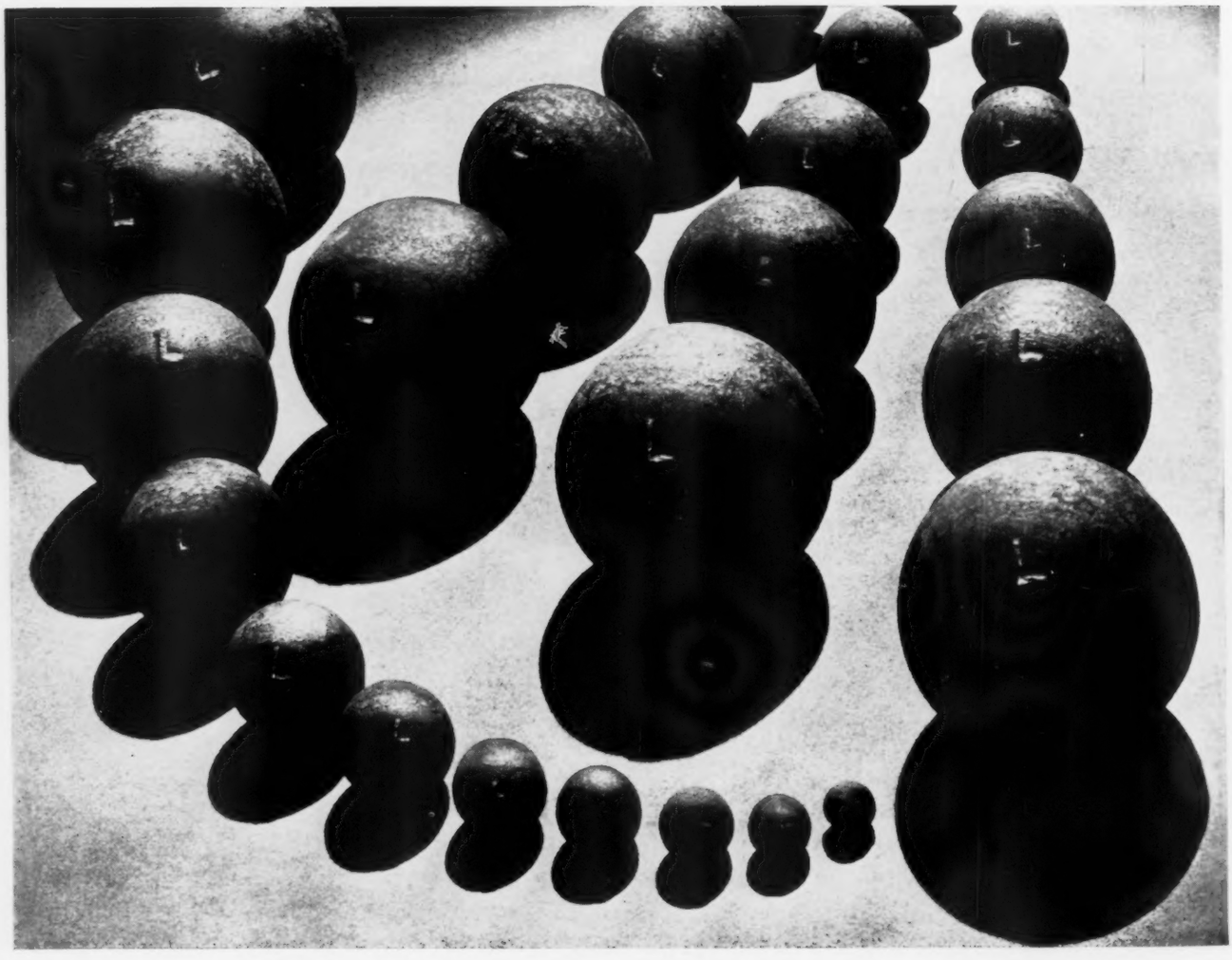
1. Generals are stronger tires — additional full-width plies of powerful cord are anchored bead to bead — with no "idle" plies — no floating breaker-strips.
2. Generals are cooler tires — they flex uniformly without that heat-producing "hinging action" of ordinary breaker-strip tires.
3. Generals have "compact rubber" treads — their construction keeps the tread rubber compact and compressed so that it wears slowly and gives more miles.

FREE

Read this booklet on how to avoid the more expensive tire troubles. Write to The General Tire and Rubber Company, Akron, Ohio. In Canada—The General Tire and Rubber Company of Canada, Limited, Toronto, Ont.

GENERAL TRUCK TIRES

OUR *Control* HELPS MAKE YOUR PRODUCT UNIFORM



WE know our ore just as you know your raw materials. With this ore, our control starts. Control follows through every step of the steelmaking to give you correct structural characteristics and proper physical properties. Control in finishing and heat treating carries on through to the final stages. Because you get the uniformity based on this control, your own product will also be more uniform.

Order Lorain Balls for cement or other grinding in these diameters — ½″, ⅝″, ¾″, ⅞″, 1″, 1¼″, 1½″, 2″, 2½″, 3″, 3½″, 4″, 4½″, and 5″.

OTHER LORAIN PRODUCTS

Mill Liners and Screens of Manganese, Chrome Nickel and plain Carbon Steel or Hard Iron; Hammers for Swing Hammer Mills; Industrial Cars and Trackwork.

CARNEGIE-ILLINOIS STEEL CORPORATION

Lorain Division

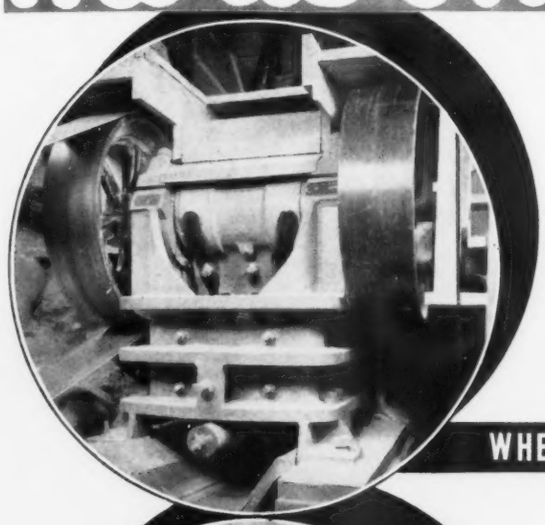
Columbia Steel Company, San Francisco, *Pacific Coast Distributors*

Johnstown, Pa.

United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

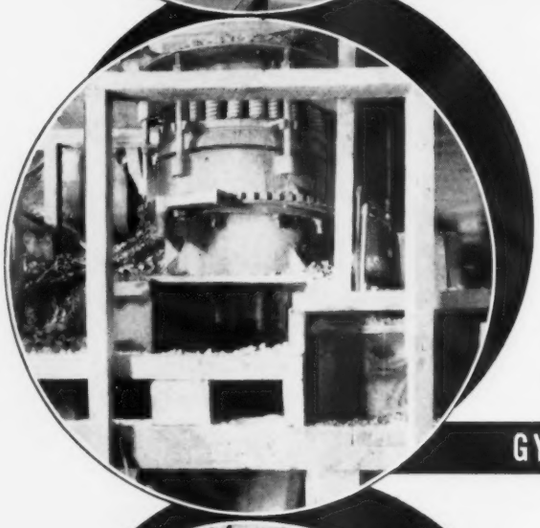
Modern IN EVERY SENSE OF THE WORD



To meet today's demands, Telsmith has built greater speed, larger capacity and lower upkeep into this three-piece combination of thoroughly modern equipment.

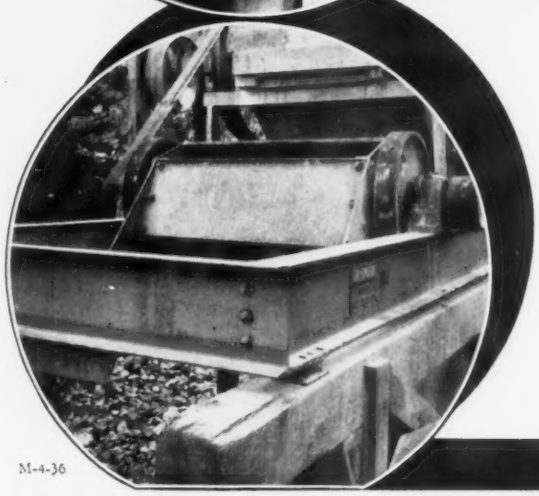
● The Telsmith-Wheeling Jaw Crusher gives greater reduction in one process than any other type of breaker. Cylindrical roller bearings, force feed, and high speed almost double capacity. Both massive frame and swinging jaw are annealed cast steel; jaw dies are manganese steel. Simple adjustment allows wide sizing range. Upkeep is reduced to a minimum. Six sizes to meet every need. *Write for Bulletin W-15.*

WHEELING JAW CRUSHER—FOR COARSE CRUSHING



● The Telsmith Gyrasphere gives you trouble-free secondary crushing...greater tonnage...a finer, more cubical product...more years of low up-keep service. Takes an unlimited choke feed. Only a Telsmith Gyrasphere Crusher has the *double-wedge crushing action*, the most effective crushing action developed in any crushing device...and *double protectors* (both labyrinth seals and piston rings) to reduce both oil consumption and maintenance expense to a minimum. *Write for Bulletin Y-15.*

GYRASPHERE CRUSHER—FOR FINER CRUSHING



● A better built, heavy-duty vibrating screen — the Telsmith Pulsator screens sand, gravel, crushed rock, ore, or coal...wet or dry. Its circular movement produces a maximum screening action...uniform on every inch of the wire...on every deck...under any load. Greater value, longer life and lower up-keep are built in — with the toughest alloy steels, the finest anti-friction bearings, and special labyrinth, piston ring seals for the protection of working parts. *Write for Bulletin V-15.*

PULSATOR—FOR EFFICIENT SCREENING

M-4-36

SMITH ENGINEERING WORKS, 504 EAST CAPITOL DRIVE, MILWAUKEE, WIS.

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Thomas G. Abrams Detroit, Mich. | Brandeis M. & S. Co. Louisville, Ky. | L. V. Fraley & Son St. Louis, Mo. | Choctaw C. & M. Co. Memphis, Tenn. | Wilson-Weesner-Wilkinson Co. Knoxville and Nashville, Tenn.

HORIZONTAL SCREENING

THE NEW Allis-Chalmers Low-Head vibrating screen is filling a definite need in many plants. Its minimum space requirements enable it to be installed in places that would accommodate no other type of screen. Very little change in plant layout is needed. One Company saved several thousand dollars with Low-Head screens as any other type meant costly extensions in elevators and raising the roof of screen house.

Not only are Low-Head screens easy to install but they give high screening efficiency with low power consumption. They are built in sizes ranging from 3′ x 6′ to 6′ x 14′, single, double or triple decks.

CRUSHING AND CEMENT

ALLIS·CHALMERS

MILWAUKEE WISCONSIN

Better Built FOR BETTER PERFORMANCE

★ The large organization and plant equipment of this company are aided by the most modern processes and laboratory facilities for producing conveyor and elevator belting of exceptional quality.

The basis of this quality is our rigid specifications of materials and a system of scientific control governing every stage of manufacture. This practice created Republic Quality Standards—higher than all other standards known to the trade. They go beyond the limits of customers' specifications, involving those intangible elements of merit and adaptability which only long experience can embody in technical production.

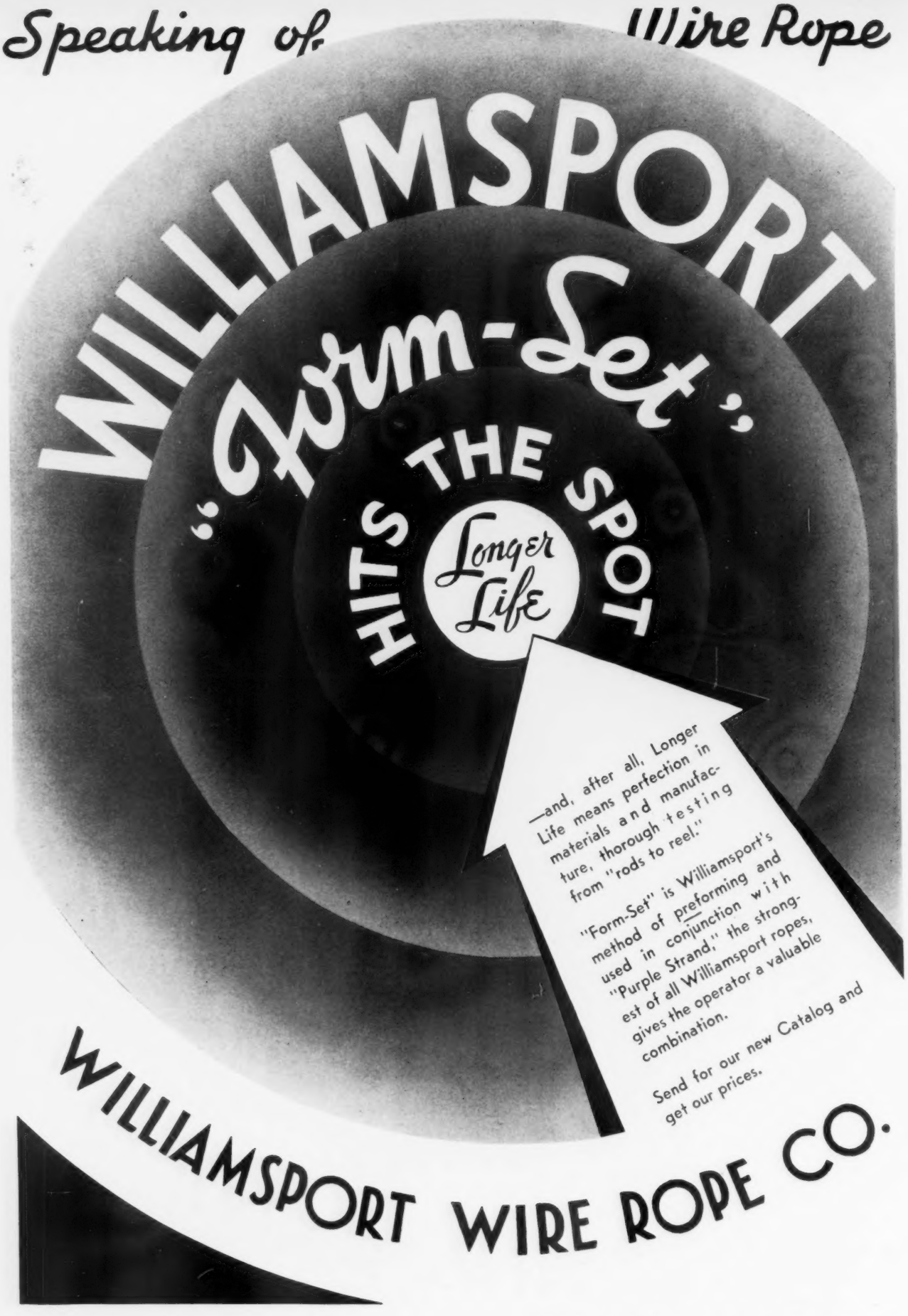
Republic Conveyor and Elevator Belts are better built to give you better performance. In quarry, sand pit and cement manufacturing operations they serve with unusual efficiency and bring load-carrying costs right down to the minimum.

Republic CONVEYOR BELTING

THE REPUBLIC RUBBER CO. «» YOUNGSTOWN, OHIO

MECHANICAL RUBBER PRODUCTS FOR EVERY INDUSTRIAL REQUIREMENT

ORDER REPUBLIC RUBBER PRODUCTS FROM YOUR DISTRIBUTOR


Speaking of Wire Rope
WILLIAMSPORT
"Form-Set"
HITS THE SPOT
Longer Life
—and, after all, Longer Life means perfection in materials and manufacture, thorough testing from "rods to reel."
"Form-Set" is Williamsport's method of preforming and used in conjunction with "Purple Strand," the strongest of all Williamsport ropes, gives the operator a valuable combination.
Send for our new Catalog and get our prices.
WILLIAMSPORT WIRE ROPE CO.

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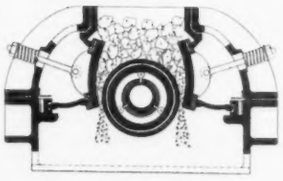
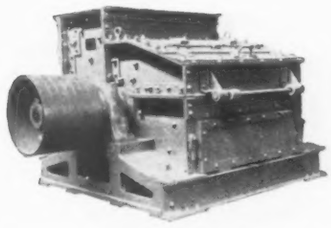
BONNOT STABILIZED ROAD MIXERS

Clay Working Machinery
Crushers
Pulverizers
Disintegrators
Pug Mills
Feeders
Dryers

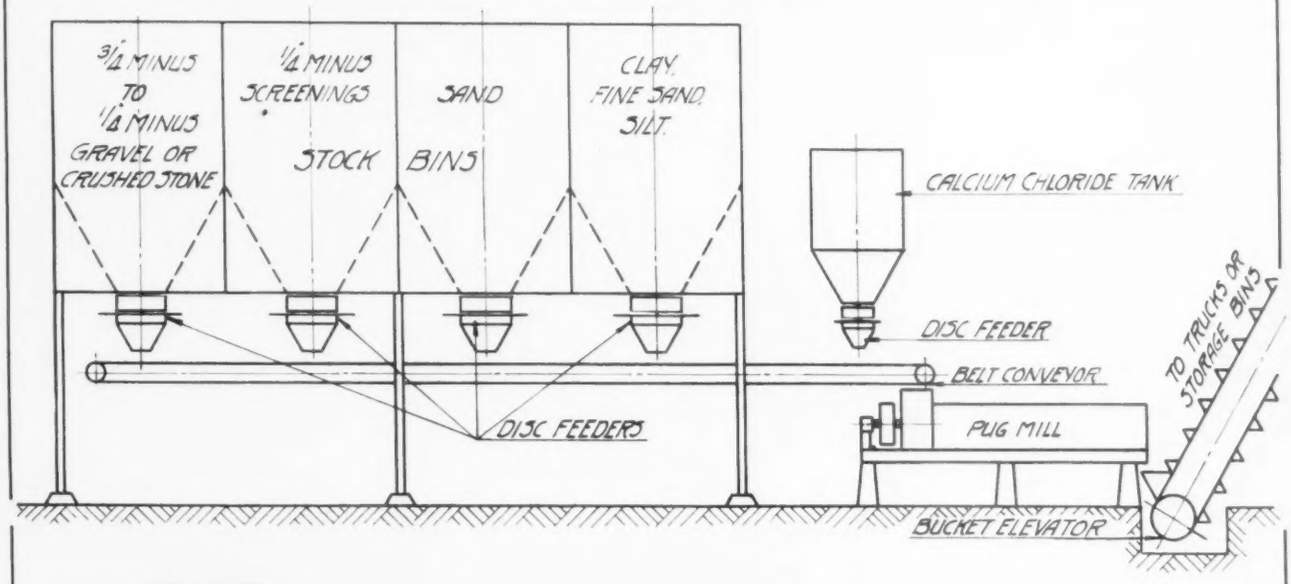


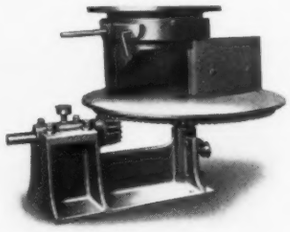
Secondary Crushers: For the preparation of the ¾" minus aggregate. Simple, rugged and economical in power.



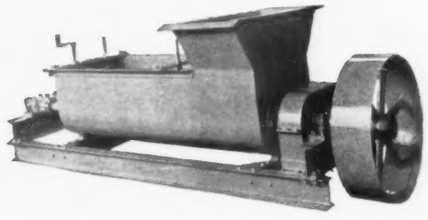
Hammer Mills: Special type to pulverize the clay and silt to 200 mesh product.

Typical Plant Flow Sheet

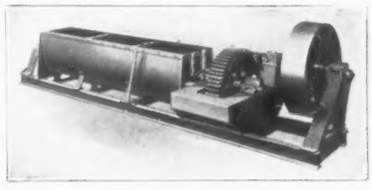




Disc Feeders: In various sizes to accurately feed and proportion the aggregates and the calcium chloride.



Disintegrators: For preparing and shredding the clay.



Pug Mills: Used as mixers and blenders of the final ingredients; ten tons to one hundred tons per hour capacities.

We are prepared to offer complete equipment for the preparation, mixing and blending of aggregates, clays and fines, required for Road Stabilization materials. Our Engineers will gladly analyze your problem and submit a proposition. Write us.

BONNOT COMPANY
CANTON, O.

New York—30 Church Street

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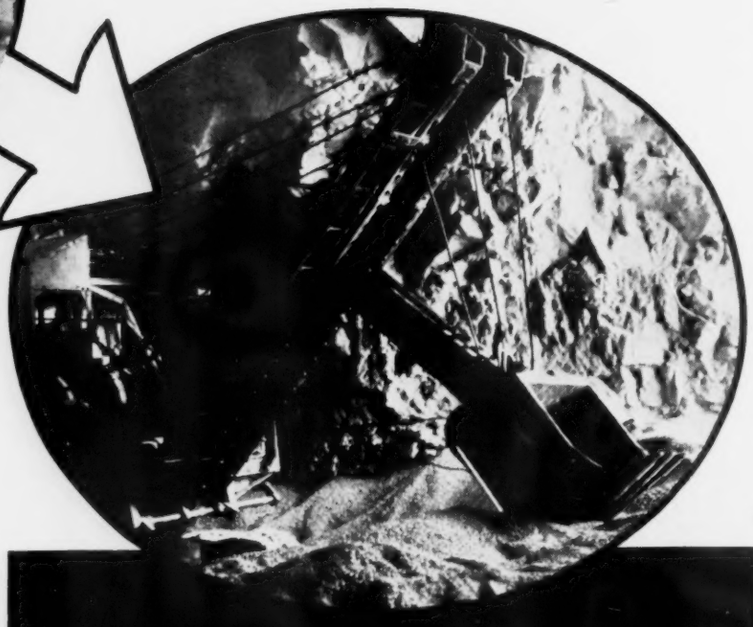
Tested and Approved for HEAVY DUTY



T-14

Only when wire comes within the narrow tolerance of our rigid specifications, is it permitted to go into any Broderick & Bascom Wire Rope.

The qualifications for use in Yellow Strand are particularly high because this celebrated rope is intended for duty where conditions are unusually severe.

"Flex-Set" Preformed Yellow Strand is made of this same high quality wire.

The difference is this: each strand is pre-shaped to the helical form it will maintain in the finished rope.

Result: a rope that is virtually prebroken in, flexible, easy to handle and install, with little tendency to kink or fatigue.

For long, satisfactory, economical service, use "Flex-Set" Preformed Yellow Strand.

"Flex-Set" Preformed YELLOW STRAND

Broderick & Bascom Rope Co.

St. Louis

Factories: St. Louis and Seattle

Branches:

New York - Seattle - Portland - Houston

AUSTIN-WESTERN
PORTABLE CRUSHING PLANTS

The No. 100 Portable Plant has a 9"x40" primary roller bearing jaw crusher and an 18"x38" roll (or 4"x40" jaw) crusher for reduction crushing. All portable plants have oversize shafts and roller bearings throughout. Compact for easy transport on steel or pneumatic tired wheels, they can be set up for operation in a few hours. The Austin-Western Crusher Line also includes individual jaw crushers of various sizes, as well as all sizes of portable plants.

Where haulage costs from fixed plants are excessive, an Austin-Western Portable Crushing Plant enables you to make sales normally out of reach.

The Austin-Western transports easily under motor truck power and delivers a large output. It is especially adapted for the small sizes of stone generally used in road construction. Low operating cost is a feature.

Strong rugged construction gives these plants great dependability. You can operate them at remote locations without fear of breakdowns.

Austin-Western builds a complete line of crushing, screening and gravel washing equipment. Write today for descriptive literature.

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The Austin-Western Road Machinery Co.
A-7, Aurora, Illinois

Tell me more about the ..... Crushing Plant.

Name .....

Address .....

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TOUGH RUBBER★ MEANS LONG LIFE FOR DUMP TRUCK TIRES

GOODYEAR DUMP TRUCK ALL-WEATHER TIRES ARE BUILT FOR MORE MILES OF DEPENDABLE SERVICE

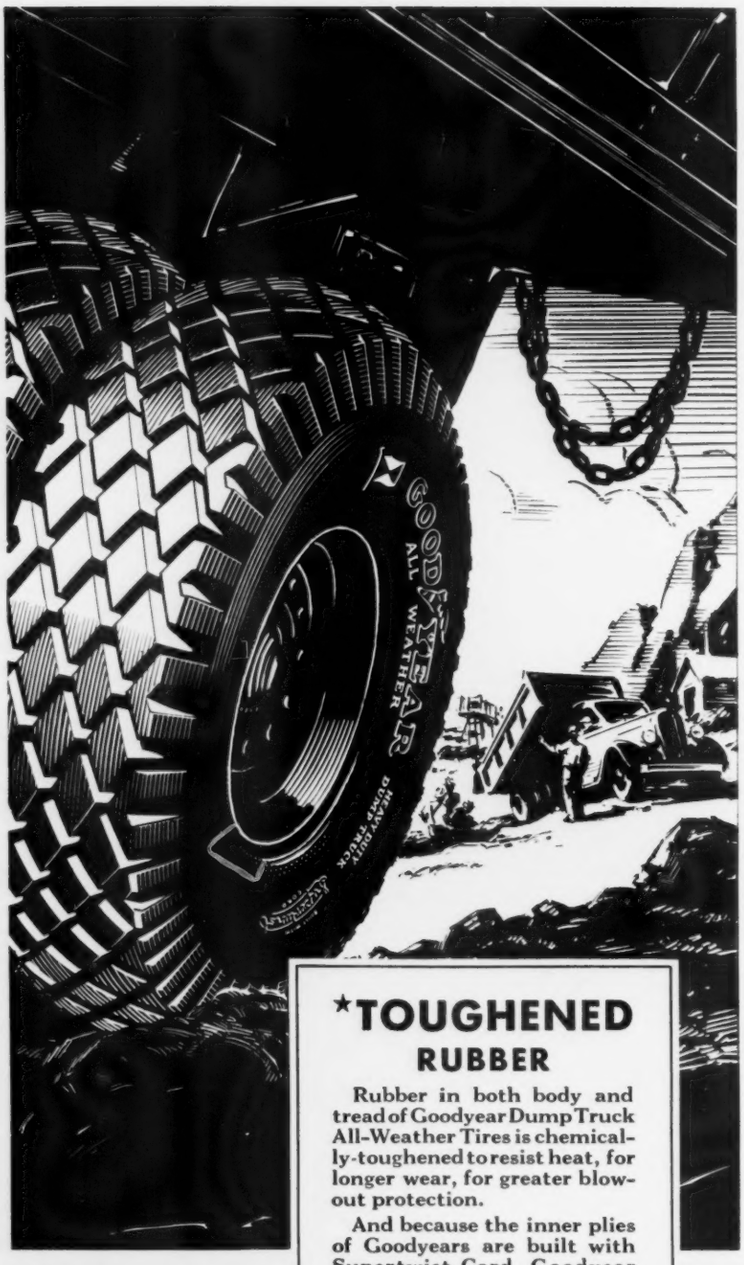
Tough rubber? Yes! Goodyear Dump Truck All-Weather Tires are built with chemically-toughened rubber in both body and tread. That means strength, durability—longer, more dependable, more economical tire service on your dump trucks.

But that's only one reason why these Dump Truck All-Weather Goodyears will bring you better tire performance. Look at these features: That famous All-Weather tread that grips and pulls on any road or in any ground. Heavy, tough sidewall bars provide added traction in ruts and protection from cutting and scraping on sharp rocks and rough surfaces. Supertwist Cord for greater body strength. Extra-Strong Bead construction for heavy, swaying loads. Pima Cotton, the longest cotton fibre grown.

You have to see—and try—these Goodyear Dump Truck All-Weather Tires to appreciate them. Once you put them on your dump trucks you'll know what we mean when we say—They're MONEY SAVERS.

GOODYEAR K-RIMS *make tire changing easy—give added strength and safety—save time and money.*

THE GOODYEAR TIRE & RUBBER CO., INC., AKRON, OHIO



★TOUGHENED RUBBER

Rubber in both body and tread of Goodyear Dump Truck All-Weather Tires is chemically-toughened to resist heat, for longer wear, for greater blow-out protection.

And because the inner plies of Goodyears are built with Supertwist Cord, Goodyear engineers are able to put into them a greater amount of chemical toughening.

In Goodyears there's blow-out protection in EVERY ply.

GOODYEAR TRUCK TIRES money savers

VOLUME 28 NUMBER 12

Pit and Quarry

With which is consolidated

CEMENT-MILL & QUARRY

CHICAGO, JUNE, 1936

Marquette Acquires Mississippi Options

NEW MILL AT VICKSBURG PLANNED

The Marquette Cement Manufacturing Co. announces that it has acquired options on rock deposits north of Vicksburg, Miss., along the Yazoo River. Work is to be begun at once on prospecting the area and, if drillings prove the rock to be suitable for Portland cement manufacture, the property will be acquired. Subsequently a cement plant will be built.

Officials of the company state that this move would not be an expansion of their present producing facilities but merely a transfer of a part of their productive capacity from one point to another. Marquette now has producing plants in northern Illinois (Oglesby) and in southeast Missouri (Cape Girardeau). "In those areas," said W. A. Wecker, president of the company, "we believe that producing capacity is so concentrated as to prevent its fullest use, no matter what condition of prosperity may be enjoyed by those regions in the future. Because of this, we are endeavoring to rearrange the locations of our total producing capacity so as to bring about a better relationship between the consuming potentialities of the various markets and the total cement production available to them."

Commenting further on the relationship of producing capacity to consumption, Mr. Wecker says: "Should we transfer part of our present producing facilities to Vicksburg, we would not be invading new markets. Marquette has served the areas around Vicksburg, down to and including New Orleans, for many years out of its packing plant at Memphis, Tenn. However, we would be recognizing a trend in consumption which seems to indicate increases in the use of concrete in the southern part of the great Mississippi valley with a consequent desire on our part of becoming more closely identified with it locally."

"Nevertheless," Mr. Wecker continued, "there would be no economic justification for increasing the capacity for cement manufacture in the South, no matter how rosy the prospects might be. Producing capacity in our industry has been built up in the past on sudden large demands in certain areas for materials for new construction projects. These initial demands were far greater than subsequent normal replacement demands could possibly be and as a consequence, we have today a concentration of capacity in these areas all out of proportion to what may reasonably be expected from normal replacement demand in the future. Consequently, shifts of this excess capacity to areas of new initial demand are imperative and we predict that the industry will witness many such shifts in the next ten years. To us, it seems, that the only alternative, in the case of many existing old plants, is deliberate reduction of capacity incident to modernization or rebuilding, so as to bring the total capacity of all more in line with present and future consumption potentialities in their respective markets."

Accompanying Mr. Wecker on the trip into Mississippi were Stuart Duncan, chairman of the board, Richard Moyle, Sr., vice-president in charge of operation, and C. M. Butler, chemical engineer. Mr. Butler has remained at Vicksburg to organize the work of prospecting the property.

May Hold Convention in December of This Year

The next annual convention of the National Sand & Gravel Assn. will probably be held early in December of this year rather than the latter part of next January as has been the custom heretofore. Below-zero temperatures which prevailed during the last gathering at St. Louis probably had a lot to do with influencing the association's board of directors in that direction.

The dates of the convention, the city, and headquarters will be decided at the semi-annual meeting of the board which will be held July 9 and 10 at the St. Paul Hotel, St. Paul, Minn.

★ Dust-collectors were recently installed in conjunction with the Raymond mills used for grinding mica and feldspar in the plant of F. E. Schundler & Co., Joliet, Ill. The equipment was designed and installed by the Northern Blower Co.

National Industrial Sand Assn. Created

RESEARCH PROGRAM IN PROSPECT

Formation of the National Industrial Sand Assn. at Pittsburgh, Pa., on April 8 has been announced. Officers of the organization are: A. Warsaw, Wedron Silica Co., Chicago, Ill., president; R. G. Hay, Ayers Mineral Co., Zanesville, O., vice-president; L. M. Hansen, Industrial Silica Corp., Chicago, Ill., treasurer.

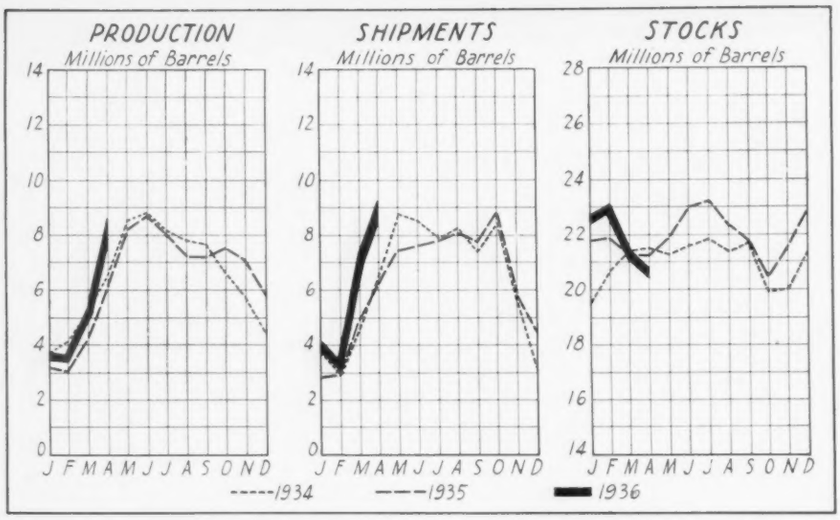
Other members of the board of directors are: George P. Allen, Tavern Rock Sand Co., Toledo, O.; E. J. Beyer, Michigan Silica Co., Detroit, Mich.; P. S. McDougall, Ottawa Silica Co., Ottawa, Ill.; Mark T. McKee, Sand Products Corp., Detroit, Mich.; A. J. Miller, Whitehead Bros. Co., New York, N. Y.; and W. J. Woods, Pennsylvania Glass Sand Corp., Lewistown, Pa.

Producers of industrial sands felt the need of some organization during the days of the N.R.A. and for two years maintained such a body as a division of the National Sand & Gravel Assn. Early this year the desirability of a separate organization was felt and the meeting at Pittsburgh was the result.

Executive work of the new association is to be handled on a part-time basis by V. P. Ahearn, executive secretary, and Stanton Walker, director of engineering, of the National Sand & Gravel Assn. and headquarters will be maintained at the Munsey Bldg., Washington, D. C., as well.

Annual dues in the organization range from a minimum of $25 for producers whose annual tonnage is 35,000 or less, to a maximum of $350 for those producers who turn out from 800,000 to 1,000,000 tons annually.

An important part of the work of the National Industrial Sand Assn. will be in research. A committee to direct this phase of its operations has been named which includes the following: T. C. Matthews, Pennsylvania Glass Sand Corp., (chairman); J. A. Crew, Ayers Mineral Co.; A. N. Farmer, Sand Products Corp.; John P. Putnam, National Silica Co.; E. O. Schneider, Ottawa Silica Co.; and James H. Whitehead, Whitehead Bros. Co.



The Portland-cement industry in April, 1936, produced 8,519,000 bbl., shipped 9,089,000 bbl. from the mills, and had in stock at the end of the month 20,556,000 bbl. Production and shipments of Portland cement in April, 1936, showed increases, respectively, of 38.8 and 46.6 per cent. as compared with April, 1935. Portland-cement stocks at mills were 3.1 per cent. lower than a year ago. The ratio of production to capacity for April was 39.2. In April, 1935, it was 27.9.

These statistics are compiled from reports for April, received by the U. S. Bureau of Mines from all manufacturing plants except one.

The mill value of the shipments (14,183,000 bbl.) in the first quarter of 1936, is estimated as $21,695,000. According to the reports of producers the shipments totals for the quarter include approximately 461,000 bbl. of high-early-strength cement with an estimated mill value of $870,000, reported as manufactured at 46 of the Portland cement plants, located as follows: One each in Alabama, Kentucky, Maine, Missouri, Oklahoma, Tennessee, West Virginia, and Wyoming; two each in Colorado, Illinois, Indiana, Iowa, Michigan, and Washington; three each in Ohio, and Texas; four each in Kansas and New York; five in California; and seven in Pennsylvania.

Puerto Rico Cement Mill Awaits Government O.K.

Although the $450,000 grant and the $550,000 loan from the Federal government have not finally been approved for the erection of a government-owned and operated Portland-cement plant in Puerto Rico, plans for its construction are said to have gone forward and are practically complete.

The proposed plant is a one-kiln operation with an estimated daily capacity of about 1,000 bbl. Charles Lewis of the Volunteer Portland Cement Co., Knoxville, Tenn., has been retained as consulting engineer.

Buys Clutch-Type Shovel for Operations in Ohio

★ The Ohio Hydrate & Supply Co. purchased a small Marion clutch-type shovel this spring for use in its crushed-stone and lime operations at Woodville, O.

Abolish Code Authority Activities in Wisconsin

The last vestiges of the old N.R.A. organization were removed in Wisconsin when Gov. Philip La Follette issued an order revising administrative procedure governing the operation of state codes of fair practice. Under the order all state code authorities are abolished and their activities and powers are centralized in the new Wisconsin Trade Commission.

Gov. La Follette brought about the change when he approved an amendment to the Trade Practices Act under which L. C. Whittet and Fred M. Wylie, members of the Trade Practice Commission, are placed in charge of the various trade and industrial agreements.

First Rock-Wool Cupola Is Fired at Marblehead

Rock-wool production at the new plant of the Marblehead Lime Co., recently built for that purpose at Marblehead, near Quincy, Ill., has been started. One furnace is in operation, another is scheduled to be built this year and two more are to be added in 1937, according to present plans.

A. T. Shrum, an experienced rock-wool operator, is superintendent of the plant.

★ Marble Cliff Quarries Co., Columbus, O., recently purchased a 50-ton Baldwin saddle-tank steam locomotive from the Southern Iron Equipment Co., Atlanta, Ga.

Universal Atlas Will Modernize Its Plants

LEEDS AND HUDSON MILLS FIRST

The Universal Atlas Cement Co. recently announced a modernization program which will affect most of the company's nine cement plants. According to this announcement a program of improvement will soon be under way at its Leeds, Ala., and Hudson, N. Y., plants which will be the first steps in the complete rebuilding of each plant. Present plans call for the complete rebuilding of several departments at each plant at a cost of approximately $1,000,000 at each plant to be completed this year.

At the Leeds plant new crushing, limestone and shale storage, and clinker-grinding departments, shops, office and laboratory will be built. New equipment installed will include primary and secondary crushers, clinker-grinding mills, and unit coal pulverizers for each kiln. A new electric shovel with Ward-Leonard control will be installed in the quarry to replace hand loading. New storage silos with a capacity of 160,000 bbl. and a new packhouse will be built. The raw-grinding department will be rearranged and may be replaced later.

At the Hudson plant new crushing, raw-material and clinker-grinding departments and a new 25,000-ton storage building for shale, limestone and clinker will be built. The crushing plant will be in the quarry and will be connected to the storage building by belt conveyors. Two 2½-cu. yd. electric shovels with Ward-Leonard control were installed recently in the quarry and trucks will replace the locomotives and cars used there. A new Diesel electric locomotive will haul loaded cars of cement to the railroad. Those departments of the plant now operated by steam will be electrified.

The improvement program at this plant will also be carried on without interference to operations. The new crushing and grinding departments will first be built and when these go into operation the old departments will be dismantled and new shops built in their place. Later improvements will be made in the same manner and the final result will be a new plant considerably more compact and better located than the old plant. As at Leeds the kiln department will be unchanged for the present.

Some improvements are now under way at the Universal Atlas plant at Waco, Tex. Air separators are being installed in both the raw and finish grinding departments and cement storage silos with a capacity of 100,000 bbl. are being added to the present silos. The Jones-Hettelsater Construction Co. of Kansas City, Mo., is building these silos. Cement-storage silos with a capacity of 160,000 bbl. and new packing facilities will also be added to the company's plant at Independence, Kan.

New Phosphate Firm Plans Huge Program

INITIAL UNIT TO COST $300,000

Plans for the formation of a large company for the development of phosphate deposits in South Carolina, mentioned in the May issue of PIT AND QUARRY, have culminated in the announcement of the formation of the General Phosphate Co., Beaufort, S. C. The new concern is to be capitalized at $3,000,000 and mining, milling and grinding equipment will be installed on a site being acquired near Beaufort at a cost of $300,000, according to Chas. V. Boykin, 5 King St., Charleston, S. C., an official of the company.

Ultimately the company plans to develop phosphate-rock properties in several of the coastal counties in South Carolina.

Petoskey Adds Equipment to Produce Specialties

★ New equipment costing $100,000 has been installed in the plant of the Petoskey Portland Cement Co., Petoskey, Mich., for the manufacture of high-early-strength cement, a water-proof cement and mortar. Production on these new items was scheduled to start about June 1. The plant opened its regular operating season in April.

T.V.A. Moves Equipment to Chickamauga Dam Site

The crushed-stone and materials-handling plant of the Tennessee Valley Authority which has been in service of the TVA at Norris Dam has been moved to the site of the Chickamauga Dam near Chattanooga, Tenn.

The equipment consists of primary and secondary crushers, a classification plant which screens the stone into four sizes, four hammer-mills, and a system of belt-conveyors.

Kansas Stone Producer Installs Air Compressor

★ Recent improvements in the quarry of the E. W. Young Stone Co. located near Augusta, Kan., include an Ingersoll-Rand compressor.

Calaveras Reduces Debt on Dividends in Arrears

Directors of Calaveras Cement Co. have declared a dividend of $1 a share on the company's 7 per cent. preferred stock, payable July 1 to stock of record June 15.

This is the fourth $1 payment to be made by the Calaveras Company in 1936 and will leave arrearage on the preferred issue at $9.75 a share. During 1935 the company paid $11 a share on the stock, which is entitled to $7 a share annually.

To Rebuild Plant After $75,000 Damage by Fire

The Buffalo, N. Y., plant of the Michigan Limestone & Chemical Co., partially destroyed by fire recently with a loss estimated at $75,000 is to be rebuilt this summer, according to an official announcement by the company.

Industrial Minerals to Erect Vermiculite Plant

★ The Industrial Minerals Corp. of America, Inc., 220 Delaware Ave., Buffalo, operating non-metallic mineral properties in North Carolina, New Mexico and other points, plans the erection of a new one and multi-story milling plant on the Buffalo waterfront for production of a new building product, using vermiculite as raw material.

Crushing, grinding, separating and other equipment will be installed. The cost will be about $100,000 with machinery.

Paul Ales Gravel Plant Will be Relocated Soon

New sand-and-gravel deposits have been purchased near Lockport, Ill., to replace those depleted by the Paul Ales plant of the Material Service Corp. The plant will be moved to the new location shortly, it is reported.

Vibrating Screen Added at Plant of Gifford-Hill

★ The No. 55 counterbalanced vibrating screen, sold to the Gifford Hill Co. by the Pioneer Gravel Equipment Mfg. Co., Minneapolis, Minn., after being on display at the St. Louis conventions early this year, has been installed in the company's plant at Roanoke, Tex.

New Quarry Drift Begun by Santa Cruz Company

The quarry of the Santa Cruz Portland Cement Co. at Davenport, Cal., is being enlarged with the beginning of a new drift under the supervision of L. R. Davis, quarry superintendent.

Buys All-Steel Portable Plant for Subsidiary Co.

★ The Hartland Washed Sand & Gravel Co. of Verona, Wis., has installed an all-steel portable plant to be operated by its subsidiary, the Hartland-Verona Gravel Co. The new plant was supplied by the Lippman Engineering Co., Milwaukee, Wis.

V. P. Ahearn to Head Silicosis Committee

COÖPERATIVE CAMPAIGN LAUNCHED

Secretary of Labor Frances Perkins has announced the appointment of four committees in the coöperative campaign to lessen the ravages of silicosis to which 500,000 workers in mines, quarries, foundries, glass works and other industries where silica dust may be inhaled are exposed in some degree. V. P. Ahearn, administrative director, National Sand & Gravel Assn., Washington, D. C., heads the Committee on Economic, Legal and Insurance phases of the silicosis problem.

A national conference to lay the groundwork for the first concerted drive against the disease which has taken a heavy toll among wage earners was held at Washington recently. Representatives of employers, workers, insurance companies, government, technical societies, engineers and physicians agreed to coöperate with the Department of Labor in a campaign to end silicosis.

Storage System Improved at Oxford, Mich., Plant

★ The American Aggregates Corp. is rebuilding its sand-and-gravel plant at Oxford, Mich. Features of the new operation will be a huge storage system and the ability of the plant to supply materials in a wide variety of mixtures or sizes. The capacity of the plant will be about 200 tons per hr.

Kyrock Resumes Work at Operations in Kentucky

Quarries and crushing plants in Edmonson County, Kentucky, have been re-opened by the Kentucky Rock Asphalt Co. After crushing the material is transported by barge to the shipping station operated by the company at Bowling Green, Ky.

U. S. Gypsum Co. Invites Bids on Montana Plant

★ The United States Gypsum Co. has asked for bids on the general contract for a new factory branch, storage and distributing plant, at Heath, Mont. The cost of the improvement will be over $100,000 with equipment.

★ A New Holland 3-ft. by 8-ft. double-deck vibrating screen was placed in service a few weeks ago by the Belmont Trap Rock Co., Inc., in its plant at Staunton, Va.

The feldspar grinding and separating plant at Marion, Ky., owned by the Aluminum Ore Co., resumed operations in May after having been closed since July, 1930.

Cement Plant Will be Erected in Argentina

ULTIMATE COST TO BE $2,430,000

A new Portland-cement plant is to be built in South America this year by the International Cement Corp. The mill will be erected at Parana, Argentina, and $2,430,000 will ultimately be spent on the operation, approximately one-half being planned for expenditure this year.

The plant is to be built on a 360-acre site containing rich and ample raw-material reserves. Single- and multi-storied units, with a power house, machine shop and other mechanical departments including storage and distributing facilities, will comprise the improvements.

Business has been good with the South American subsidiaries of International Cement Corp. More than twice the producing facilities are being utilized than in this country, where last year the company's mills operated at only 29 per cent. of capacity.

The company made a considerable investment in plant expansion in South America last year also. The cement mill at Guaximdiba, Brazil, had its capacity more than doubled with the installation of a second rotary kiln, new grinding equipment and quarry machinery.

New Executives at Helm of Company in Virginia

The Charleston Mining Co., Inc., Richmond, Va., has an entirely new set of officers as follows: S. L. Carter, president; M. L. Boinest, vice-president and secretary; H. E. Perry, treasurer; G. G. Osborne, asst. secretary; and L. W. Dunn, asst. treasurer.

The company produces phosphate rock, operating two mines in Tennessee and one in Florida.

Consolidated Feldspar to Build Plant in Colorado

Approximately $100,000 is to be spent by the Consolidated Feldspar Corp., Trenton, N. J., on a new plant for treating and crushing feldspar at Canon City, Colo.

Gravel Plant Erected by Navigating Co. in Oregon

A new sand-and-gravel plant was opened recently at Reedsport, Ore., by the Umpqua River Navigation Co.

Ceramic Engineers Start Building Insulation Mill

★ Production is expected to be under way by August 1 at the new rock-wool plant of the Seneca Rock Wool Co. of Tiffin, O. Work on the plant was begun late in May. I. B. Engle and Karl Heilman, ceramic engineers who formed the concern, are said to have developed an entirely new method for producing the insulating material. Ultimately the plant will have a capacity of 40 tons daily with 30 men on the payroll.

W.P.A. Pit Workers Quit in Row Over Delayed Pay

After going more than a month without receiving a pay check, 45 W.P.A. workers in a sand-and-gravel plant at Iron River, Mich., refused to resume work early in May and the operations were closed.

Silica Dust, Lime Form Basis of New Insulator

A new type of heat and sound insulating building material known as "microporite" has been developed in Europe for interior use. Silica dust ground to a fineness of 98 per cent. through a 200-mesh sieve is mixed with lime and water, molded, and treated with steam for 7 hr.

The process is similar to that employed in the manufacture of sand-lime brick, but the reaction is more rapid and complete. The units are strong, although they weight only 25 to 50 lb. per cu.ft.

Illinois Gravel Company Petitions to Reorganize

The Lincoln Sand & Gravel Co. of Lincoln, Ill., has filed a petition in the Federal court at Springfield, Ill., asking that it be allowed to reorganize under Section 77B of the bankruptcy act.

The company, ordered to give notice of the hearing to all stockholders, creditors, officers, directors and employes, lists its assets and liabilities both at $284,579.07.

The company has produced and marketed sand and gravel at its present location since 1917.

Yakima, Wash., Gravel Co. Changes Operating Name

The Yakima Sand & Gravel Co. has succeeded the Sand & Gravel Supply Co. at Yakima, Wash. Leo S. Ross, president of the old concern, heads the new company which has been capitalized at $25,000.

Mississippi Plant, Idle Since 1928, Is Rebuilt

★ The Brookhaven Gravel Co., of Crystal Springs, Miss., is being rebuilt in preparation of putting the plant back into production. It has been idle since 1928. T. W. Maddux is the engineer in charge of the plant.

At the same time it is learned that the Central Mississippi Gravel Co. also at Crystal Springs but owned by the Birmingham Slag Co., will begin operations after a lapse of several months.

State Puts "Teeth" in Royalty Legislation

MICHIGAN INVOKES RIGID RULES

Effective for the first time this year, the removal by commercial operators of sand and gravel from the bottoms of Lakes Michigan, Superior, Huron, Erie and St. Clair under Michigan's jurisdiction will be subject to rigid regulations, violations of which will entail severe penalties.

The last session of the Michigan legislature put "teeth" into the laws governing removal of sand and gravel from state lands and gave the Michigan Department of Conservation the authority and responsibility of enforcing the law.

"In the past the general fund of Michigan has derived a revenue of upwards of $50,000 a year from the sand-and-gravel industry in times of normal building operations," said Fred P. Struhsaker, chief of the Lands Division, Department of Conservation. "This revenue was formed entirely of the charges made as royalties on leases granted to commercial operators for the privilege of removing sand and gravel from the waters of the Great Lakes under Michigan's jurisdiction.

"It has been known, of course, that the regulations governing this removal were not, in all cases, fully complied with and that substantial losses were taken by the state because regulations were not sufficiently rigid and enforceable.

"The amended law, which commercial operators must observe this year, requires that leases be obtained from the Department of Conservation to permit legal operations in the waters of the Great Lakes. The lease form will authorize removal of marl, stone, rock, sand, gravel and earth from the beds of waters described at a rate of 10 c. a cu.yd. for the sand and 16 c. for the gravel."

Producers Lease Office Space in Builders Bldg.

Among the new tenants who recently signed leases for office space in the Builders Bldg., 228 N. LaSalle St., Chicago, are the Vermont Marble Co., the Utica Hydraulic Cement Co., of Utica, Ill., and the Monon Stone Co., Monon, Ind.

★ A Marion Model 450 1¼ cu.yd. shovel is among the recent equipment additions made by the River Products Co., Iowa City, Ia.

★ Jahncke Service, Inc., New Orleans, La., has added to its concrete-delivery fleet through the purchase of two truck mixers manufactured by the Concrete Transport Mixer Co.

Stearns' 85-Year-Old Chicago Quarry Sold

MATERIAL SERVICE BUYS PROPERTY

The purchase of the Stearns Lime & Stone Co. of Chicago, Ill., including the 27-acre tract of land fronting on Halsted St. between 27th and 29th Sts. together with the stone and lime plant, by the Material Service Corp., also of Chicago, was announced May 30.

The purchase was made from Markus Stearns, the 94-year-old son of the founder of the company, for an undisclosed consideration. The guarantee policy issued by the Chicago Title & Trust Co. on the real estate alone, however, was in the amount of $450,000.

The plant and quarry, which occupy approximately the center of the property, started operations in 1850. One of the buildings, in present use as a plant office, is reputed the oldest building in Chicago. In addition to the tract being unusually large in size considering its location, three and a half miles from Chicago's "loop," the lime plant and stone quarry are the only ones within the Chicago city limits.

The plant includes six lime kilns and stone crushing equipment built alongside the quarry, which has been mined continuously for the past 85 years. The quarry has reached a depth of 280 ft., which, it is contended, accounts for the extraordinary quality of hard stone produced. The lime is produced from stone obtained from a higher level where the material has an unusually high calcium content.

Purchase of the Stearns company makes the third new property acquired by the Material Service Corp. since the first of the year. The others were a gravel plant at South Elgin, Ill., and a 1,300-acre stone quarry at Fairmount, Ill., formerly the source of flux-stone supply for the Illinois Steel Corp.

The Material Service Corp. is transferring the headquarters of the Stearns company from 105 W. Adams St. to its own general offices at 33 N. La Salle St.

Buys Three-Compartment Bin, Weighing Equipment

★ The West Virginia Sand & Gravel Co., Charleston, W. Va., recently purchased a rebuilt Butler 135-cu.yd. three-compartment steel bin equipped with a three-beam weighing device for installation at its plant. The Equipment Corp. of America, Chicago, Ill., handled the sale.

Lehigh Stockholders to Accept New Stock Issue

Stockholders of the Lehigh Portland Cement Co. have approved a plan of recapitalization already approved by the board of directors.

Under the plan, the company will exchange one share of a new 4 per cent. convertible preferred stock and half a share of common in exchange for each share of present 7-per cent. preferred. Holders of the 4-per cent. stock will receive $12.50 a share cash in consideration of surrendering their rights of the existing 7-per cent. issue, including $13.12½ dividend arrears as of April 1, 1936.

The plan also calls for reducing the par value of the common to $25 a share from $50 a share.

New Hampshire Diatomite Co. in Operation Shortly

The New Hampshire Diatomite Co., Portsmouth, N. H., which took over the property formerly owned by the American Agricultural Chemical Co., is about to begin operations. Much new machinery has already been installed and the company is awaiting the arrival of a classifier before manufacturing will begin.

Builds Lime-Rock Plant to Serve Road Projects

★ The Marianna Lime Products Co., Marianna, Fla., is building a new lime-rock plant at Phillips, near Macon, Ga. This plant will supply material for a highway construction project but may later be made permanent. M. A. Grandy, vice president and general superintendent, is supervising the erection of the plant.

Cement Plant Operating After 4-Year Shutdown

After having lain idle for four years, the Quincy, Mich., plant of the Wolverine Portland Cement Co. has again gone into operation, working 24 hr. daily. Before opening, a number of improvements were made including the erection of new storage facilities, rebuilding of scows and dredging of the channel.

U. S. Gypsum Co. Doubles Dividend Rate on Stock

A quarterly dividend of 50 c. a share on the common stock has been declared by directors of the United States Gypsum Co. payable July 1 to stock of record June 15. This places the common stock on a $2 annual basis against $1, plus extras, heretofore. A regular quarterly disbursement of $1.75 on the preferred stock was also declared.

Bessemer, Huron Plants Install Dust Collectors

★ The Bessemer Limestone & Cement Co., Bessemer, Pa., has installed Northern Blower Co. dust-collectors in its finish-grinding department. The Northern Blower Co. also completed a dust-collection system recently at the Huron Portland Cement Co. pack-house at Cleveland, O.

Building Near 5-Year Peak, Figures Show

FOUR MONTHS INCREASE IS 85%

With but one exception (December, 1935) construction contracts let during April were higher than for any other month since October, 1931, according to figures from F. W. Dodge Corp. April awards amounted to $234,806,300 in the 37 states east of the Rocky Mountains as contrasted with $198,978,300 for March and only $124,020,000 for April, 1935. All major branches of construction shared in the general gains, with non-residential building and heavy engineering projects showing the best relative improvement over a year ago.

Residential building awards during April amounted to $67,151,000 as against $55,220,600 for March and $42,202,800 for April, 1935. For non-residential building, the April contract total amounted to $94,242,800 as contrasted with $81,460,300 for March and with $41,328,100 for April of last year. April awards for heavy engineering projects amounted to $73,412,500 as compared with $62,297,400 for March and with $40,489,100 for April, 1935.

For the first four months of 1936, construction contracts for all classes in the 37 eastern states totaled $780,627,600, making a gain of 85 per cent. over the total of $421,781,500 for the corresponding four months of 1935.

British Cement Officials Depart After U. S. Visit

(Picture on page 75)

Five British cement officials returned to London aboard the *Queen Mary* recently after a tour of the United States where they viewed concrete structures and highways, visited several cement plants and attended the spring meeting of the Portland Cement Assn. in New York, N. Y.

The visitors included Lord Wolmer, chairman of the Cement Makers' Federation; Albert Y. Gowen, managing director of Alpha Cement, Ltd.; Major R. A. B. Smith, director of the Cement and Concrete Assn. of England; Harold H. Drew-Anderson, managing director, Associated Portland Cement Manufacturers, Ltd.; and Halford Reddish, managing director of the Rugby Portland Cement Co., Ltd.

★ An 8-in. centrifugal sand pump for recovering sand to be used in brick making has been installed in the plant of Ulster Davis, Inc., Rensselaer, N. Y. The pump is direct-connected to a Diesel engine and was supplied by the Lawrence Machine & Pump Corp., Lawrence, Mass.

. . . Editorials . . . . . .

An Opportunity Lost

MOST Americans interested in the welfare of their country, Democrats as well as Republicans, must have looked forward with eager expectancy to the Cleveland party convention. For there would certainly be an opportunity, they must have thought, to hear not only the ranting declamations of partisan politicians but the studied counsel of one who had accomplished big things in nonpolitical spheres and who, while occupying the position of highest responsibility to the American people, had given some evidence of being concerned with their well-being. They had some reason to believe that the man who had had four years intimate contact with the problems of a great nation—three of those years fraught with the trials of economic depression—would set forth some guiding principles, offer a practical plan, and set himself apart as a leader having not alone a clear understanding of national needs but also the willingness to rise above the clamor of interparty strife. Even among persons of opposite-party affiliations there was some hope that through his example, freed from the selfish ambitions of one seeking personal advancement and fully authorized as the accepted head of his party, an attitude genuinely heedful of the good of the country might emerge.

Unfortunately, however, these expectations were not to be realized, for evidently Mr. Hoover had not intended to do any of these things. He did none of them and, therefore, may be supposed not to have wished to do any of them. He could have raised convention sentiment, at least for the duration of his speech, above the level of passion and prejudice, but he did not. He could have rallied the sincere, intelligent and humanely-minded elements of the gathering into a focal point of constructive and forward-looking opinion, but he did not. He could have presented a plan that would have won the support of hopeful men and women outside as well as inside his party, or, lacking a program, he could have suggested some lines of approach toward a solution of our problems, but he did not. He could have advised dispassionate consideration of the country's condition and needs, he could have urged thoughtful study of the nation's future and of sane ways of meeting and insuring it, but he did not.

It is true, as Mr. Hoover asserted, that the responsibility which rested upon the convention "far transcends all partisanship," yet his speech was conspicuously free from any attempt on his part to orient himself in a nonpartisan atmosphere. He had given, he told his listeners, "about four years to research into the New Deal, trying to determine what its ultimate objectives were, what sort of a system it is imposing on this country." Many of his hearers, particularly those outside the convention hall, must have wished that he had given as much time, either during the same period or, preferably, during his tenure of the presidency, to a study of economic trends in this country, to the rapidly rising curve of unemployment and the resulting rise in the curve of political discontent, to the necessity for action that would first ameliorate and then correct conditions which even conservatives could no longer look upon with complacency. Yet, if such an investigation, which he dignified with the term "research," had been no more penetrating than it was in the case of the New Deal, his results would have been no more conclusive or valuable.

MR. HOOVER'S public enemies of "starry" eyes, determined, as he sees it, "to infect the American people by a mixture of European ideas, flavored with our native predilection to get something for nothing," have no need to search beyond our borders to find the seeds and the soil for the growth of disaffection. Fascists, socialists, communists and the other groups who cry for change thrive on American as well as foreign soil, provided only that the ground in which their seeds germinate be sufficiently unbalanced in the economic and political sense. There is nothing peculiarly European about the philosophies of such groups, nor is there anything characteristically American about what Mr. Hoover calls the "American system of freedom." All peoples love freedom, the freedom to think as they please, to act and to refrain from acting in their own interest as they see it, to speak without restraints other than those dictated by a regard for sincerity and truth, to learn and weigh the opinions of others, and to observe the passing scene uninfluenced by misrepresentation. They care little, however, for the freedom to remain unemployed, uneducated, undeveloped and unfed. Destitute men and women seeking work that is not to be found, hungry men and women yearning for food that is not available, homeless men and women in need of clothing and shelter are not much interested in academic discussions of liberty, freedom of contract, due process of law, freedom of speech and of the press. There is no tyrant as despotic as destitution, no specter as haunting as the fear of starvation. No prettily turned phrases, such as Mr. Hoover's "freedom to work for himself," can assuage the torments of the man with empty pockets and an empty stomach. No rhetorical outbursts, such as his "slavery of work for the follies of government," can strike terror into a faltering spirit, a weakening mind and a wasting body. The

average hungry man would prefer and would be better able to accept the mental disappointments of "regimentation" on a full stomach than the empty-handed blandishments of those who prate about the glories of constitutionally-guaranteed but actually-unattainable liberties. Men fight for liberty but they do not accept starvation to attain it. Mr. Hoover said that dictators—and presumably, by inference, the so-called "New Dealers"—"may not have maimed the bodies of men, but they maimed their souls." When health is impaired, when regularity of employment and nourishment has been lost, people may be excused if they display more interest in the maiming of their bodies than in the possible maiming of their souls. To the millions of such persons who have been taken "for a ride into the wilderness of unemployment," as Mr. Hoover dramatically expressed it—as well as to the millions who were similarly transported during the closing years of his administration—his convention utterances carried neither conviction nor promise.

IN being invited to address the Republican delegates at Cleveland and, through the facilities of the radio, millions of expectant voters of various party and class sympathies Mr. Hoover was given a great opportunity to serve the nation as well as his party. He might have discussed, as he should be qualified to do, the real economic and political problems that confront our people—a vast army of unemployed employables in the face of a general longing for productive and remunerative work; production facilities that are but partially utilized despite a nationwide demand for their products; a growing lack of confidence in a politico-economic situation that seems to be unable to point the way to something more secure; a general stiffening of the conservative, "stand-pat" attitude with its resultant encouragement of extreme opinions, fallacious doctrines, and violently-revolutionary class movements. Instead he indulged in repetitive panegyrics about such intangibles as "fundamental American liberties," the "free spirit of men" and the "inspiration of freedom."

He might have talked about the growing needs of humanity for social security, for cultural and material advance, for freedom from the terrors of recurring economic collapses, for opportunity to develop their capacity for creative, self-expressive work, for actual and not alone theoretical equality of opportunity to find psychic as well as physical satisfaction in the pursuit of happiness. Instead he devoted his time to derisive sallies, invective and verbal excoriation.

At several points Mr. Hoover came hopefully near making something worthwhile of his opportunity—once when he said that "the Republican party must achieve real social betterment," then again when he said that "we must achieve freedom in the economic field" and yet again when he said that "the Republican party must be a party that accepts the challenge of each new day." At each point it seemed that he was through with temporizing, through with rhetorical flourishes, through with destructive criticism and ready for constructive suggestion. Yet every hope-inspiring step in the direction of progress was checked by the staying hand of retrogression—"But we must produce measures that will not work confusion and disappointment" . . . "But change which destroys the safeguards of free men and women are only apples of Sodom." What a pity that Mr. Hoover did not see fit to say what millions of Republicans and Democrats would have been delighted to hear him say, what would have struck the chord of intellectual response in business men and workers, in producers and consumers, what he came so very near saying!

Mr. Hoover had a great opportunity to attract to the Republican party millions of Democratic votes and to hold within the ranks of party loyalty the votes of many Republicans who can see beyond the traditional limitations of "Old Guard" Republicanism. Fate gave him the chance, second only to that of being nominated for the presidency, of pointing the way out of the wilderness, of leading partisanship into the ranks of national service, of directing an outwardly confident but secretly discouraged party toward the goal of great accomplishment, but he either failed to recognize it or wilfully disregarded it. This opportunity, properly seized, might have won for the Republican ticket the votes of hordes of what Republicans would call "thinking" Democrats. One may well wonder whether the failure to grasp it may not have lost to the cause of Republicanism the votes of as large a number of what Democrats would call "thinking" Republicans.

MR. HOOVER might have directed his appeal to the intellect of his audience; he chose, instead, to direct it toward their emotions. The response was in kind—enthusiastic, vociferous, emotional. He did what a hundred newspapers had already done, and had often done better; he lashed the New Deal with all the vehemence of which he was capable, he was vituperative far beyond the needs or the proprieties of the occasion, he left his hearers with very little time for reflection on the unfavorable reactions which many of his statements provoked. We repeat that Mr. Hoover had a great opportunity, one such as few others have had, and he either overlooked it or wasted it. For this, being admirers of many of his qualities, we are profoundly sorry.

That Mr. Hoover's attacks were not accepted at their face value by other leaders of the Republican party is evident from the platform adopted. Except for its attitude on the question of the president's power to devalue the dollar and his power to negotiate tariff treaties, this document offers no criticism whatever of the other New Deal measures which have escaped Supreme Court disapproval. Mr. Landon's qualified acceptance of the platform is another indication of the readiness of leading Republicans to liberalize the party's position. Mr. Hoover's speech might, we believe, have harmonized, instead of accentuating, these discordant notes.

By W. E. TRAUFFER

General view of operations at Pickwick Landing Dam. In the background are the aggregate and cement-unloading and storage facilities with belt-conveyor system and pipe line feeding to mixing plant in foreground. Conveyor carrying concrete to lock is at right.

HANDLING THE A

THE dams which have formed an important part of the program of the Tennessee Valley Authority have presented interesting aggregate-production problems. For this reason articles describing these problems and the manner in which they are solved have been published in PIT AND QUARRY for the benefit of aggregate producers who may encounter similar conditions. The production of aggregates for Norris Dam was handled by a crushed-stone plant of unusual design, which also produced stone sand. A description of this plant, which was operated by the T. V. A., and a discussion of the problems encountered in its operation, were published in the September, 1934, issue of PIT AND QUARRY. The sand and gravel for the Wheeler Dam were produced under contract by a commercial operator, who delivered it at the damsite to the T. V. A. mixer barges. Many interesting features of the operations at Wheeler Dam were described in an article published in the August, 1935, issue of PIT AND QUARRY.

Pickwick Landing Dam, the third dam in the T. V. A. program, is now being built, and the aggregates used in its construction are produced and handled in a manner different from that followed at the two preceding locations. Sand and gravel are produced under contract by a privately-owned dredge and are delivered to a shore-storage plant operated by the T. V. A. As at the Norris and Wheeler dams, concrete mixing is done by a T. V. A.-operated central plant. And, as was the case with the Norris and Wheeler articles mentioned above, the information for this article describing operations at Pickwick Landing was secured by the writer through a personal inspection of the site and plant.

Pickwick Landing Dam is being built across the Tennessee River at Pickwick Landing, a few miles north of the Mississippi-Tennessee state line, and just upstream from Shiloh National Park, scene of one of the important battles of the Civil War. It will consist of earth embankments built across the valley on either side of the river, with concrete structures erected across the main channel including a navigation lock, a spillway, and a non-overflow section. The total length of the dam will be 7,715 ft. On the south side an earth embankment will extend 4,680 ft. from high ground to the lock, and on the north side an 890-ft. embankment will extend from the concrete section to high ground. The lock will have a chamber 600 ft. long and 110 ft. wide, and will have a single lift of 66 ft. The

View of lock under construction taken just before the flood. Note equipment placed above expected flood level.

Conveyor from receiving hopper to radial storage system. Head tower track is in foreground.

E AGGREGATES AT PICKWICK DAM

concrete overflow spillway across the river channel will be 1,155 ft. long, and north of it will be a 767-ft. concrete non-overflow section designed so that, if desired, a power-house may be built on the downstream side in the future. A total of 608,000 cu.yd. of concrete will be required. The reservoir formed will extend upstream 53 mi. to Wilson Dam, and will have a capacity of 807,000 acre-ft. at normal headwater elevation. Completion of this dam will aid navigation and flood control and will insure year-round commercial navigation from the mouth of the Tennessee River at Paducah to the head of Wheeler Pool at Guntersville, Ala., a distance of 358 mi. Actual construction of the dam began early in 1935, and pouring of the concrete on the locks began late in 1935. A temporary concrete-mixing plant inside the cofferdam was used until the present plant went into operation in February, 1936.

The sand-and-gravel contract for the Pickwick Landing Dam is held by the Cumberland River Sand Co., of Nashville, Tenn., which also supplied the sand and gravel used in the construction of the

Another general view at Pickwick Landing Dam taken when the flood was near its height in April.

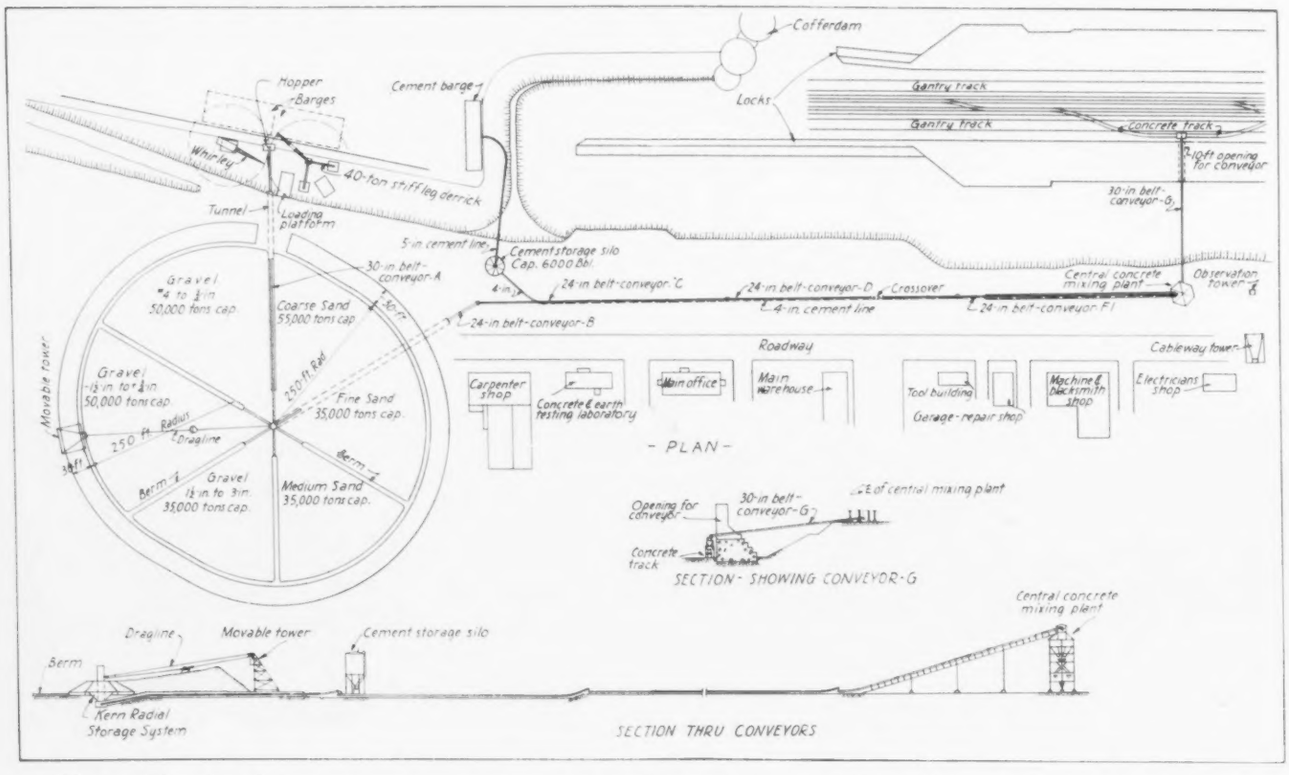
Whirley and stiff-leg derrick unloading sized aggregates from barges on Tennessee River to plant hopper.

The radial storage system with movable head tower at left. Operator controls scraper system from house near top of tower. Belt-conveyor feeding storage system is at right.

Wheeler Dam. This contract calls for 1,000,000 tons of aggregates. As in the case of the Wheeler Dam, this company is dredging the sand and gravel from the Tennessee River with the dredge Kentucky, which has a capacity of about 400 tons per hr. of washed and graded aggregate. This dredge is of the bucket-ladder type, and was described in the Wheeler Dam article previously mentioned. At present dredging operations are being carried on about 8 mi. upstream from the damsite. The same towboats and 750-ton barges described in the Wheeler article are being used.

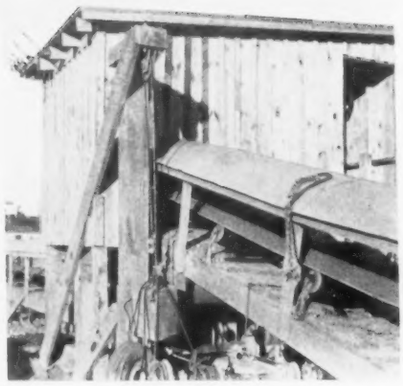
The barges are delivered to a dock on which is located the plant-feed hopper. Barges are unloaded by a Clyde stiff-leg derrick having an 80-ft. boom handling a 2-cu.yd. clamshell bucket. The 3-drum Clyde hoist operating the derrick is driven by a 150-hp. G. E. motor through silent chain and gear. An American Hoist & Derrick Co. whirley supplements the derrick and is located on the opposite side of the hopper. This whirley has a 75-ft. boom and handles a 2-cu.yd. Erie clam-shell bucket.

The steel-lined timber hopper has a capacity of 60 cu.yd. and has a Jeffrey-Traylor vibrating feeder

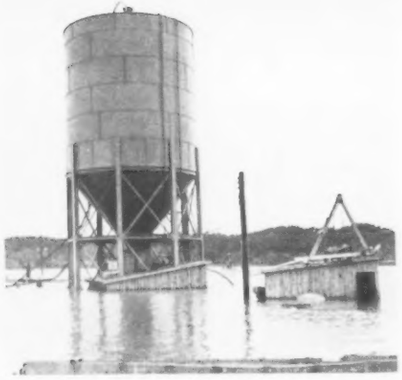


Plan and elevation of aggregate and cement storage and handling and concrete-mixing facilities at Pickwick Landing Dam.

The 2½-cu.yd. drag scraper moving material from live to dead storage.



Transfer point for conveyors carrying aggregates from storage to mixing plant.



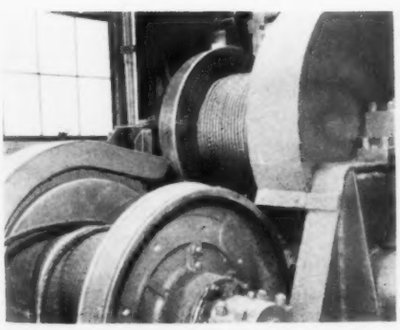
The 6,000-bbl. cement-storage silo when the flood was near its height.

which discharges to belt-conveyor A leading to the Kern radial storage system. This conveyor is 30 in. wide and operates on 425-ft. centers. It runs horizontally through a concrete tunnel under a roadway and is then inclined to the top of the Kern storage tower over one of the berms separating the storage sections. This conveyor is driven by a 60-hp. geared-head motor through a flexible coupling. As at Wheeler Dam, the dredge produces three sizes of gravel: No. 4 to ¾-in., ¾-in. to 1½-in., 1½-in. to 3-in. All sizes are handled separately from the barges to storage. There is considerable variation in the gradation of the sand dredged from the river, and for this reason three of the six storage sections are used respectively for fine, medium and coarse sands. The medium sand can be used as it is, and the other two grades are blended to meet specifications.

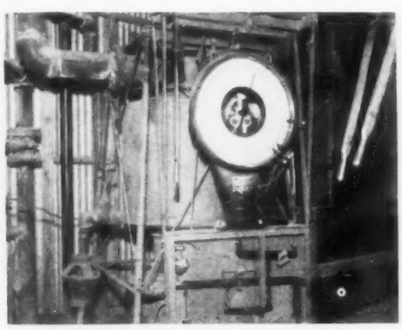
The six sizes of aggregates are discharged to their respective storage sections through chutes by means of a roller-mounted revolving spout. These sections are separated from each other by timber partitions which support the central storage tower. Each section has a live-storage capacity of 500 tons. Unlike past installations, the storage section is elliptical instead of circular. The head-tower track surrounding the storage is on a 250-ft. radius from the central tower for one 180-deg. section, which is used mainly for sand storage. The other 180-deg. section has a radius of 250 ft. from a center 75 ft. from the tower, and is used mainly for coarse-aggregate storage. This arrangement results in total storage capacities of approximately 35,000 tons for each of the three grades of sand and of 50,000 tons for each of the three coarse aggregates. Handling of the aggregates in storage is done with a 2½-cu.yd. Sauerman Crescent scraper, which has its tail pulley attached to a steel ring encircling the central tower. The head tower, which moves around the storage, is 60 ft. high and runs on a 30-ft.-gage track. The scraper head pulley on this tower can be raised or lowered, depending on the height of the stock-pile. The scraper is operated by a 2-drum Kern hoist, driven by a 100-hp. Allis Chalmers motor. The scraper system is operated by one man in the head tower.

The use of the Kern radial system of storage makes it possible for the entire aggregate production to be put in storage over long periods of time when little material is being used and in periods of peak demand several times the aggregate production capacity can be supplied. This is especially important at Pickwick Landing because of floods and low-water conditions in the Tennessee River, which sometimes interfere with regular aggregate production, and because the rate of pouring of concrete varies considerably in the construction of the dam. This system also balances variations in the quantities of various sizes of materials produced with respect to the demand.

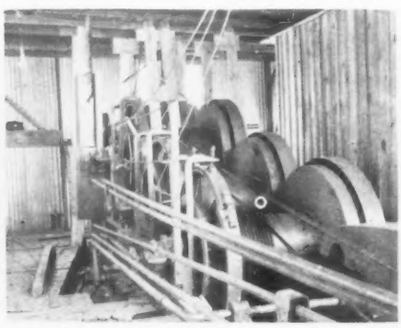
The three coarse aggregates and the sand are handled separately from live storage to the central concrete-mixing plant by a series of 24-in. belt conveyors. Lift chutes with sliding gates discharge the



The 2-drum hoist in the traveling head tower which operates the drag scraper.

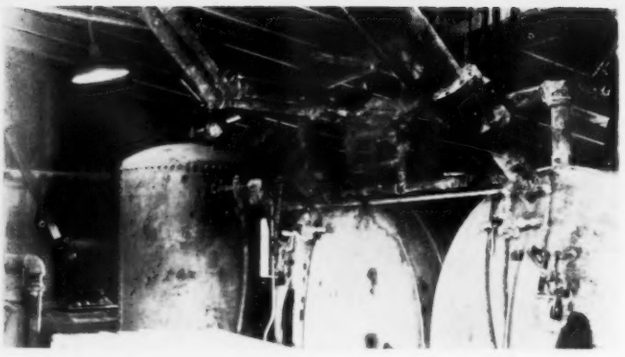


The 100-gal. weighing tank which proportions all water for concrete.



The 3-drum hoist which operates the aggregate-unloading stiff-leg derrick.

Barge-load of cement being brought to Pickwick Landing from loading point on Tennessee River.



The air-activated conveyor system which transports cement from storage silo to mixing plant.

material from the live-storage sections to a standardized arrangement of mixing chutes feeding to belt-conveyor B, which operates on 380-ft. centers in a concrete tunnel. The gates are calibrated to allow blending of the sand and of the gravel if desired. Conveyor B is inclined at its discharge end sufficiently to discharge to conveyor C, which operates on 400-ft. centers and inclines to discharge to conveyor D, operating on 368.5-ft. centers. Conveyor F is inclined to discharge into the mixing-plant bins, and operates on 360-ft. centers. The six compartments of the C. S. Johnson hexagonal aggregate-storage bin have a combined capacity of 750 cu.yd. All the conveyors, except conveyor B and that part of conveyor A which is in a tunnel, are housed in steel framework and corrugated-metal roofing. The inclined sections of conveyors A and F are supported on structural-steel framework. Conveyors B, C, D and F, are driven through flexible couplings by geared-head motors of 25-, 15-, 15-, and 50-hp. respectively.

The bulk cement used in the construction of the dam is received in barges from a barge-loading plant near Sheffield, Ala. The same system was used to supply Wheeler Dam. The cement is being furnished by eight different companies sharing in a long-time contract to serve several T.V.A. projects. At the Pickwick cement unloading dock, two Fuller-Kinyon portable cement unloaders handle the cement through a 5-in. line to a 6,000-bbl. steel storage silo. A Robinson air-activated conveyor system handles this cement through a 4-in. pipe-line a distance of 1,300 ft. with a 110-ft. vertical lift to the mixing plant storage bin which has a capacity of 750 bbl. This system consists of two 55-bbl. conveyor cylinders working alternately every 5 min. on an air pressure of 50 lb. and is conveying 150 bbl. of bulk cement per hr.

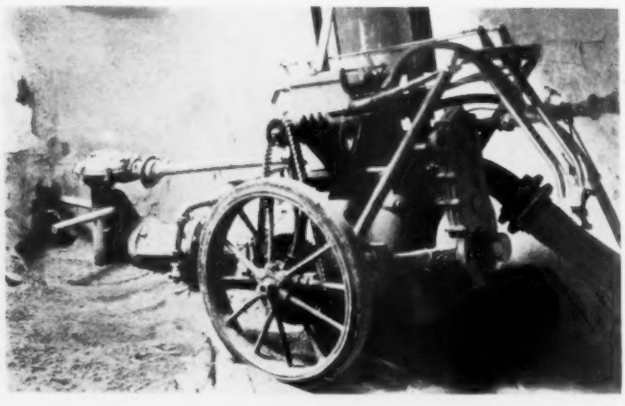
The five 38-cu.ft. Johnson aggregate-weighing batchers are fed from the bins by means of lever-

The electric vibrating feeder which provides steady flow of aggregates from hopper to storage system.

controlled gates. On the same floor is the 20-cu.ft. Johnson cement-weighing batcher and a 100-gal. Johnson water-weighing tank. All these units are equipped with dial scales and are controlled from a central board. The cement, aggregates and water are discharged to three 2-cu.yd. mixers, two of which are Norris K. Davis tilting units and the third a Ransome drum-type mixer.

The mixed concrete is discharged to a collecting hopper which discharges on a Barber-Greene 30-in. down-hill belt-conveyor G operating on 240-ft. centers. This conveyor is driven by a 7½-hp. geared-head motor through chain and discharges the concrete into a hopper inside the cofferdam. In pouring the lock the concrete is loaded from the hopper into 4-cu.yd. buckets which are transported in pairs on flat cars. These cars are hauled to the pouring site and the concrete buckets are handled by cranes to the forms for placing. Later when the spillway

(Continued on page 55)



One of the portable unloaders which transfer cement from barge to storage silo.

LIME PRODUCERS HOLD CONVENTION

Technical and marketing problems discussed at Hot Springs . . S. W. Stauffer made president

FORTY-FOUR lime producers, representing twenty-seven companies, assembled at the Homestead, Hot Springs, Va., June 3 and 4 for the eighteenth annual convention of the National Lime Assn. They listened to interesting discussions of the use of lime in the treatment of sewage and industrial wastes and of water supplies, in the paper industry, in soil liming and in masonry. The advantages of aged lime putty and the types of refractories used in lime burning were the subjects of other papers.

Lime in the Treatment of Sewage and Industrial Wastes was read in the absence of the author, W. A. Hardenbergh, vice-president of *Public Works*, by W. V. Brumbaugh, secretary and assistant treasurer of the association. After reviewing the historical record of the subject briefly the author told of the results obtained in chemical treatment.

"The degree of treatment obtained by using chemical precipitation," he said, "is not so good as that secured by the use of secondary treatment devices, such as trickling filters, or by the use of the activated-sludge method of treatment, but it is better than that obtained by sedimentation alone, and may frequently be all that is required." He said that chemicals are of special value in caring for plant overloads and in affording an added degree of treatment when there are low water flows in diluting streams. Their use may also make possible a more rapid operation of secondary treatment devices.

The chemical is usually added to the sewage. The resulting gelatinous precipitate, or floc, settles to the bottom, taking with it much of the suspended matter and some of the colloidal matter. The equipment required, except for the chemical-mixing units, is so similar to that used in ordinary sedimentation that plants designed for sedimentation may be easily changed for chemical treatment.

The air-mixing equipment provided at a plant designed to treat 1,250,000 gal. of sewage daily cost less than $2,500. It comprises two sedimentation tanks fitted with apparatus for removing the sludge daily, two sludge-digestion tanks, chlorination equipment, and sludge-drying beds. The mixing tank allows operation of the equipment as a chemical-precipitation plant when desired. This change is necessary in the case of the plant cited, because the city which owns it is a summer resort and the population is almost tripled during the season when the stream flow is lowest.

The prevailing method of treating sewage chemically employs iron salts for coagulation, after a preliminary dosing with lime to provide the pH values suitable for coagulation. The use of copperas or ferrous sulphate also requires lime to produce the desired floc, a ferric hydroxide. The lime is first added to the sewage, the author explained, generally in excess of the amount required to complete the theoretical reaction to raise the pH value, the excess acting as an additional clarifying agent. The same general reactions, resulting in the formation of ferric hydroxide, follow the use of lime with other iron salts, such as ferric sulphate, ferric chloride, ferrous chloride, and chlorinated copperas. The lime is added first and when the pH value has been raised sufficiently the iron salt is added by means of flocculators or blowers.

Lime is not often used with alum because the latter coagulates on the acide side—that is, at a low pH value. Therefore, lime may be necessary to correct the acidity of the sludge to improve subsequent digestion.

The author said that lime may be used alone as a precipitant, "combining with the carbonic acid present to produce calcium carbonate, which is the desired coagulant." More lime is needed than when iron salts are used with it, but if too much is used, caustic calcium hydroxide may be formed, resulting in the breaking down of particles of organic matter and the production of an unsatisfactory effluent.

Among patented processes using lime and iron salts the author mentioned particularly Laughlin's and Streander's methods. The former uses ferric chloride with lime; paper pulp is sometimes added. The process employs sedimentation followed by upward filtration through crushed magnetite. One plant uses 150 to 350 lb. of lime per 1,000,000 gal. of sewage. In another plant the lime dosage averages 600 lb. The Streander method uses ferrous sulphate and lime with air and follows with sedimentation and filtration. About 400 lb. of lime is used per 1,000,000 gal. of sewage.

In some plants the lime dosage runs as high as 800 lb. per 1,000,000 gal. of sewage, but the average is likely to be somewhere between 400 and 500 lb. Mr. Hardenbergh believes that for a city of 25,000 population with a flow of 3,500,000 gal. of sewage daily the amount of lime used would aggregate 1,500 lb. a day.

Lime is used also for correcting acid conditions in the sewage or in the sludge. For this purpose it may be added to the incoming sewage or, as is more often the case, to the sludge-digestion tanks or to the sludge chambers of Imhoff tanks to correct acidity or improve digestion. Lime has been used in dosages of about 100 lb. per 1,000,000 gal. in combination with chlorine to improve Imhoff tank operation.

In the treatment of industrial wastes of almost every kind lime has a place, according to Mr. Har-

denbergh. In the canning industry the wastes are highly acid and ferric chloride, copperas and alum have been used, each in combination with lime. Three tons of lime per 1,000,000 gal. of waste is the usual dose. Lime and iron salts are used also in treating creamery and milk wastes and those coming from the scouring, bleaching and dying processes of the textile industry. Iron and lime or acid and alum are used to treat laundry wastes, which are highly alkaline, 16 lb. of lime per 1,000 gal. of waste being used in some cases.

There are about 3,500 sewage-treatment plants, of which, Mr. Hardenbergh thinks, 1,000 are large enough and modern enough to utilize chemical treatment. In 1935 there were in operation 35 plants using chemical precipitation, 9 were under construction and 23 planned. Most of the plants being built are adaptable to the use of the chemical method and are built with a view to its possible use.

Charles P. Hoover, chemist in charge of the Columbus, O., water-softening and precipitation works, spoke on *The Development and Treatment of Water Supplies*. He stated that 20,000 tons of lime is used annually for water treatment in Ohio alone. The state has 45 water-softening plants using lime and 10 using zeolite. Other states, notably Indiana, Illinois, Iowa, South Dakota, Nebraska, Kansas, Oklahoma and Arizona, are more in need of lime than Ohio. Many eastern states need lime treatment to prevent the corrosion of tanks and pipes, he said, and mentioned Baltimore as the largest city using the method. This plant will use just enough lime to provide an anti-corrosive lining but not enough to build up too thick a coating.

The speaker explained that lime prevents corrosion and zeolite softens the water by removing the hardness compounds. The use of lime increases slightly the hardness of the water. By treating the water first with lime and then with zeolite the corrosive condition can be corrected. The largest plant using the combination method is at Findlay, O. The trend is toward the use of lime-soda ash in the large plants and toward the use of zeolite in very small plants.

The hardening compounds encountered in treating water are $CaCO_3$. CO_2, $MgCO_3.CO_2$, $CaCl_2$, $CaSO_4 + Na_2Co_3$, MgCl, and $MgSo_4$. The first two are most easily removed by lime, according to the speaker, and the last four more cheaply by zeolite. Of the many forms of zeolite the synthetic variety is $Na_2O.\ Al_2O_3.\ (SiO_2)_x\ (H_2O)_x$.

The many uses of lime in the paper industry were discussed by John Traquair, director of research of the Mead Corp., large paper manufacturer of Chillicothe, O. It is employed as a reagent in rag boiling, the cooking of straw for straw-board, the manufacture of bleach liquor, the causticizing of bleach liquor for the soda and sulphate processes, in the making of sulphite pulp and some high-alpha pulps, in the making of coating colors such as satin white, in the manufacture of calcium carbonate for coating and filler, and for such auxiliary processes as water softening, effluent purification, etc.

The soda process which Mr. Traquair described as the largest user of lime requires about ½ ton of lime per ton of pulp. The speaker's company, a large producer of soda pulp, uses daily 100 tons of bulk lime, 45 tons of dolomitic lime and 55 tons of high-calcium lime.

In rag boiling lime is being displaced by sodium carbonate and caustic soda because of the desire to reduce the time required and to obtain a more thoroughly purified product. For clean rags lime is employed and for dirty rags soda ash.

In the making of straw-board the straw is cooked with about 10 per cent. of lime as a milk of lime. Caustic soda gives a much stronger pulp but the stock is very slow. Soda ash, sodium sulphite and sodium sulphide have also been extensively tried as substitutes for lime, but although less of those is required, their cost is high and lime holds its position in the making of this low-cost commodity.

Lime is now seldom used in the sulphite process except in the manufacture of bleach. Instead the sulphur dioxide gas from the sulphur burners after cooling is forced up towers packed with limestone and down which water trickles. The limestone functions in absorbing and combining with the SO_2 to form soluble calcium bisulphite. In some processes each ton of partly-bleached pulp is boiled with about 90 to 100 lb. of lime as part of the bleaching and purification process in the manufacture of certain grades of pulp to be used in making rayon.

The lime used for making bleach should have a high percentage of available CaO, and a low but fast-settling sludge, the speaker said. The slaked lime is made up separately and is pumped into deep tanks fitted with high-speed stirrers. Chlorine gas is then fed in near the periphery of the propeller, which breaks it up into a large number of minute bubbles that are easily absorbed by the lime. Lime is giving way to caustic soda because it forms sparingly soluble compounds with the chlorinated lignin and is not easily washed out. Caustic soda gives a greater degree of purification.

The most modern use of lime is as a filler. Lime sludge from the causticizing plant was formerly wasted, amounting in the case of the speaker's company to more than 30 tons a day. It was believed that if the process could be changed to produce a clear clean leach liquor and if a good lime were used, the lime sludge would be suitable for use as a filler and would be cheaper than English clay. The requirements of a good lime for causticizing leach liquor were that it be high in available CaO and that the resulting carbonate be quick-settling and easily washable by decantation. Dolomitic lime was considered useless, as it was low in available CaO and gave a fine slow-settling precipitate which was difficult to handle and wash. The introduction of the Raffold process using dolomitic lime and rotary vacuum filters has made practical the use of lime sludge as filler. Carbonate filler gives paper a brighter color, better opacity and a better and more ink-receptive printing surface. Paper makers who do not produce their own pulp use a specially precip-

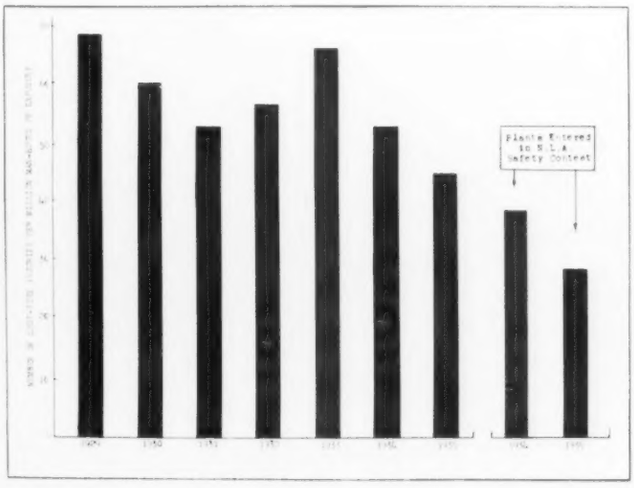
itated calcium carbonate, made by the precipitation of milk of lime with CO_2.

The speaker referred to the use of slaked lime and alum as a paper coating where high gloss is desired. Calcium carbonate, owing to its cheapness, whiteness and good printing quality, is gaining favor as a coating material. If recently developed methods for applying the coating on the paper-making machine are further improved they will widen the potential market for carbonate fillers.

As a result of the lime association's accident-prevention work during the last two years, an annual saving of $146,000 to the lime industry is already indicated, according to Paul Hatmaker of the association's staff. The upward trend in the industry's accident rate apparent in the years 1931 to 1933 has been checked, the reductions having amounted to 20 per cent. in 1934 and to approximately 16 per cent. in 1935, for which year complete figures are not yet available. Mr. Hatmaker displayed the accompanying chart to illustrate the changes in the accident-frequency rate from 1929 to 1935 for the industry as a whole and the records made by lime plants entered in the association's safety competition in 1934 and 1935. The average rate for lime plants is 52.9 compared with a rate of 41.8 for all quarries.

The lime industry still has "at least five times the number of accidents it should have, judging by the accomplishments of those who have carried on a safety program over a considerable number of years," according to him. Some good results have been obtained, however, and he cited the fact that in the initial competition covering a half-year period the contestants had an accident frequency rate of 28.6, which was 26 per cent. below the former year's figure.

The cost of an average accident, including fatalities and permanent disabilities and covering the loss of wages, medical expense and the overhead cost of insurance, is $435. From this base figure the annual expected saving of $146,000, mentioned above, has been calculated.



Accident-frequency rates in the lime industry, 1929-1935.

Mr. Hatmaker emphasized the truth that lime plants can be operated safely. "The head of the company must be 'sold' on safety work, and his enthusiasm must seep down through the organization even to the newest and greenest man on the payroll," he said. "The plant must be made safe mechanically through adequate guards, proper manways, and well-maintained steps, treads and the like. . . . The men must be trained to work safely, and each man should be instructed in first aid. Responsibility for these things must lie equally upon the foremen and the superintendent."

The speaker named the following plants as being entitled to the special certificates of honor awarded to those plants which passed through the last half of 1935 with no lost-time accidents:

Ash Grove Lime & Portland Cement Co., Galloway, Mo.
J. E. Baker Co., Thomasville, Pa.
Lehigh Lime Co., Mitchell, Ind.
Marblehead Lime Co., Quincy, Ill., and South Chicago, Ill.
National Gypsum Co., York, Pa.
Newala Lime Works, Newala, Ala.
North American Cement Corp., Berkeley, W. Va.
Warner Co., McCoy, Pa.

A discussion of the many factors that should be studied when considering a change from open-pit to underground mining of limestone was presented by J. R. Thoenen, senior mining engineer of the U. S. Bureau of Mines Field office at College Park, Md. As points to be considered he mentioned the cost of overburden removal; the hampering of operations by weather conditions—excessive heat, storms, etc.; the fact that the overburden contaminates what might otherwise be clean stone; the complaints caused by quarry blasting, resulting in some cases in the abandonment of quarries; municipal restrictions; and the like.

Some changes result in failure because of a lack of knowledge on the part of the quarry superintendent, Mr. Thoenen said. In underground mining the pillar support must be adequate, requirements differing with differences in conditions. Changes in the drilling and blasting methods are necessary, although these are less if the low-bench method using hammer drills has been employed. The fumes from underground blasting must be considered. More skilled labor will be required in underground operations and for this purpose metal miners will be found better for drilling and blasting than coal miners.

The use of steam, gasoline and Diesel locomotives and motor trucks underground is dangerous. Electric-trolley and storage battery locomotives are safer. Belt-conveyors are worth investigating, he said. The extra expense necessitated by provisions for lighting and ventilation must be considered.

Among the disadvantages of underground mining Mr. Thoenen mentioned higher cost, which is generally from 10 to 30 per cent. above that of open-pit mining. In one mine producing limestone by underground methods the cost is less than 16c. a ton. Other disadvantages are the facts that often only

half of the material is recoverable; that the method is dangerous even though the employment of experienced men reduces the hazards; that permanent lighting in the rooms is impossible because of the blasting; and that there are more spalls and fines because of the confined blasting.

The chief advantages he enumerated as the absence of overburden, its inevitable contamination of the stone, and the problem of its disposal; more regular working and steadier employment because of freedom from weather conditions; better grade strata may sometimes be removed without disturbing poor strata; less blasting vibration because of numerous small blasts instead of larger blasts.

The Preparation and Advantages of Aged Lime Putty was the subject discussed by Hayden Brooks of the Standard Building Material Co., Birmingham, Ala. Mr. Brooks is the inventor of the Brooks system of making lime putty.

He referred to the ready-mixed-mortar and plaster plant erected in Birmingham at a cost of about $75,000 in 1926. This utilized the Blue Diamond process of aging slaked-lime putty in concrete vats, which had a total capacity of 11,200 cu. ft. The plan, as Mr. Brooks described it, was to slake the putty as thick as possible, screen, it, and pump it into the vats for aging. The excess water which would rise to the top after several days would be pumped off, but two or three weeks' time was required to remove enough water from the putty to make it stiff enough for proper workability. The lime-slaking and sand-handling equipment had about five times the capacity of the vats, but although space for additional vats was available they were not added because the consistency of the putty was not satisfactory. Elevated, water-tight, steel tanks were built and wood floors, above 4 in. of sand, were placed in their bottoms, from which the water settling downward could be drained through valves. Although the aging period was reduced to one week, there was a variation in the consistency of the putty.

The newest equipment uses four filters, extending from the top to the bottom, in each 12-ft.-diameter tank. They are spaced to provide the shortest possible travel of the water out of the putty mass into the filters. The water passes at all levels from the putty into the filters and then to the valves without passing through all the putty. All the water that is to be removed can be taken out in from 2 to 7 days, depending on the characteristics of the lime used; the consistency of the putty is uniform throughout.

The new method effects a saving in time, a great improvement in the consistency of the putty, and uses about 20 per cent. less quicklime than the vat system. This is attributed to the facts that the putty is much more plastic and that the plasticity and consistency are constant provided the gradation of the sand is fairly constant.

The lime, which is received in bulk, is slaked in a batch slaker under the control of a recording thermometer, one man slaking 25 tons in 8 hr. According to Mr. Brooks, it was soon found that a definite water ratio could not be relied upon as a different consistency of putty would result from the use of different carloads of lime coming from the same lime plant. By trial a definite temperature, which would produce from the available limes a putty as thick as could be screened and pumped into the tanks, was determined and the lime-and-water method was discarded. It was found that the amount of water required to slake a ton of lime at a given temperature varied as much as 15 and 20 per cent. for different carloads of lime coming from the same plant, but that the putty produced would always be of the same consistency.

Mr. Brooks has found that the putty yield of various quicklimes varies according to the amount of lime dust present, lime without dust producing greater yields. His lime purchase specifications, therefore, require that there be no lime under ½ in. and none over 2½ in. in size. When these are complied with, the yield is almost constant. Alabama limes slaked at 180 deg. F. will produce 106 cu. ft. of freshly-slaked putty per ton of quicklime, said the speaker, and at the end of 6 or 7 days of filtering will yield 80 cu. ft. of stiff putty.

Mr. Brooks said that tests have shown that a perfect-working brick mortar can be obtained by mixing only 5 sacks of cement and 4 cu. ft. of lime putty with each cu. yd. of sand, instead of the 9 sacks of cement specified by architects. This mortar met all strength requirements and its workability was such that the brick masons won the architects' approval of it. This type of mortar sold for $7.75 per cu. yd. and a saving of 50c. per 1,000 brick was made through its use, the masons laying more brick. Masonry contractors offer to lay brick at $1 per 1,000 less if they are furnished with lime putty mortar instead of that containing hydrated lime. Lime-putty mortar has been used on more than 6,000 jobs, or over 90 per cent. of all the work done in Birmingham in the last ten years, due, as Mr. Brooks believes, to the "excellent workability produced by the aged lime putty."

He advised lime manufacturers to strive hard for the mortar business by promoting the building of ready-mixed-mortar plants and by developing a quick-soaking lime hydrate to be used in improving the workability of mortar cements.

Irving Warner, vice-president in charge of production, Warner Co., Philadelphia, in speaking of the results obtained by his company with a Brooks lime-putty plant, said that the product was so well received that a new 3-tank plant, having twice the capacity of the present 2-tank plant, is being built in Philadelphia. The company's plant operated successfully during six weeks of below-freezing weather last winter, although the low temperatures caused some broken putty.

Refractories Used in Lime Burning were discussed in a paper prepared by Dr. R. P. Heuer, director of research, and L. J. Trostel, chief chemist, General Refractories Co., Philadelphia. As this paper will be published in full in an early issue of PIT AND QUARRY, no effort will be made to abstract it here. Suffice it to say that the discussion embraces

the service requirements of modern lime-kiln lining, research trends in refractories, changes in the manufacturing processes to produce high-density by brick, and the protection of joints and brickwork.

Dr. Jackson B. Hester, soil technologist of the Virginia Truck Experiment Station at Norfolk, spoke extemporaneously on *Recent Developments in Soil Liming*. His remarks were illustrated with stereopticon views. Among other comments he said that soils having pH values between 6.0 and 6.6 give the maximum yields for many truck crops and that even if soil conditions are very poor, the use of lime greatly increases the yield.

Walter C. Voss, professor of building construction at the Massachusetts Institute of Technology, spoke on *Progress in Masonry Research*, reviewing the developments of his research activities during the past year. He recommended that architects or consulting engineers be given complete control in the erection of buildings if water-tight walls are demanded and the results must be guaranteed. He favors ready-mixed mortar and concrete because of the close control exercised. Lime manufacturers should, he believes, refuse to sell lime to mortar makers who refuse to provide accurate control.

John C. Best, president of Best Bros. Keene's Cement Co., Medicine Lodge, Kan., and president of the Gypsum Assn., urged upon his hearers greater coöperation between lime manufacturers, particularly in such matters as the rivalry between producers of high-calcium and dolomitic limestone. He also spoke in favor of research on fire-resistive materials.

In this connection S. Walter Stauffer, acting executive officer of the association, advocated the abolition of trade names on such products as masonry mortar and plaster in order to advance the use of lime for both purposes by softening the intra-industry competitive situation.

The convention adopted unanimously the reports of the treasurer, the Trade Relations Committee and other committees as well as the 1936-37 budget, which is based on a levy of 6c. a ton and an estimated membership output of 1,200,000 tons.

The officers elected for the new year are: S. Walter Stauffer, president and general manager; Ralph P. Wilton, treasurer; W. V. Brumbaugh, secretary and assistant treasurer; and Miss Roma F. Medford, assistant secretary.

The following directors were elected:

District 1—C. C. Loomis, president, New England Lime Co., Adams, Mass.

District 2—Reed C. Bye, vice-president, Warner Co., Philadelphia, Pa.

District 3—S. C. Mathias, sales manager, Standard Lime & Stone Co., Baltimore, Md., and A. M. Tyree, secretary, North American Cement Corp., Baltimore, Md.

District 4—James H. McNamara, president, Eagle Rock Lime Co., Eagle Rock, Va.

District 5A—William F. Stolzenbach, president, National Mortar & Supply Co., Pittsburgh, Pa.

District 5B—Russell Rarey, vice-president, Marble Cliff Quarries Co., Columbus, O.

District 6—Gordon W. Hughes, sales manager, Inland Lime & Stone Co., Manistique, Mich.

District 7—G. H. F. Johannes, president, Glencoe Lime & Cement Co., St. Louis, Mo.

District 8—(Not yet decided).

District 9—Henry LaLiberte, president, Cutler-Magner Co., Duluth, Minn. (Chairman).

Districts 10 and 11—Warren Lewis, vice-president and general manager, Longview-Saginaw Lime Works, Birmingham, Ala.

District 12—J. F. Pollock, vice-president, Ash Grove Lime & Portland Cement Co., Kansas City, Mo.

District 13—Cecil R. Haden, secretary, Haden Lime Co., Houston, Tex.

District 14—John S. McMillan, president, Roche Harbor Lime & Cement Co., Roche Harbor, Wash.

District 15—R. E. Tremoureux, treasurer, United States Lime Products Corp., San Francisco, Cal.

The executive committee comprises Messrs. LaLiberte (chairman) and Bye; J. M. Gager, president, Gager Lime Mfg. Co., Chattanooga, Tenn.; G. J. Whelan, president, Kelley Island Lime and Transport Co., Cleveland, O.; and B. L. McNulty, president, Marblehead Lime Co., Chicago, Ill.

Pickwick Dam

(from page 50)

and non-overflow sections are under construction the concrete will be transferred from the hopper to buckets handled by a cableway system which is to be installed. All operations are controlled through signal and telephone systems connecting all departments.

The entire conveying system was designed and supplied by the Barber-Greene Co., including carrying and return idlers, head and tail pulleys, etc. Barber-Greene automatic gravity take-ups are used on all conveyors. The carrying idlers are of the 3-roll troughing type equipped with 4-pass labyrinth grease seals. The carrying idler frames are tilted in the direction of belt motion to keep the belts in alinement, and are of the self-shedding, all-welded inverted angle type to prevent the material from building up under the rolls. All the idlers are interchangeable and quickly removable, and are equipped with Shafer self-alining roller bearings which require greasing only twice a year. The Barber-Greene Co. also supplied the motors, drives and electrical equipment for these conveyors. Goodrich belting is used on all conveyors.

The floods which raised the Tennessee River to near record level in April caused the suspension of all operations for several weeks. Water was over the top of the lock cofferdams and flooded the sites of the aggregate and concrete plants. The belt-conveyor systems were entirely submerged with the exception of conveyor G from the mixing plant to the lock which was removed and later replaced. The river end of conveyor A from the dock to the aggregate storage was also dismantled to make room for a sack dam in the conveyor runway. With these exceptions all the conveyors were under water during the peak of the flood. To prevent damage from the water and silt the idler bearings were pumped full of grease before the flood. After the flood these conveyors were put back into operation with no trouble of any kind.

GRAVEL STOCK IS MATERIAL SOURCE FOR SILICA PLANT

The W. R. Bonsal sand-and-gravel plant and storage bins from which the silica sand is supplied.

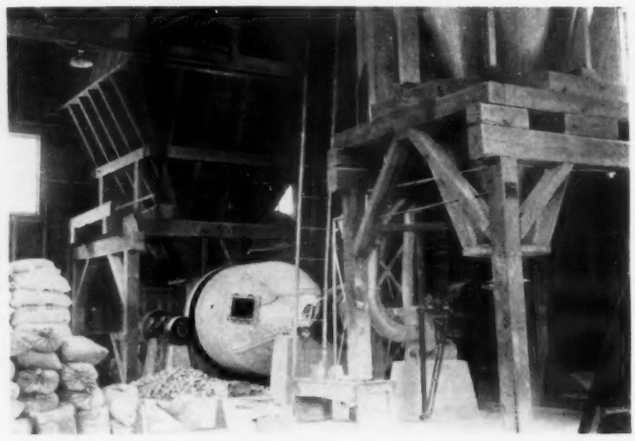
MANY producers of sand and gravel can justly boast of a deposit of siliceous material of exceptional purity and quality but few of them are able to market this material in competition with producers of silica sand. One of the few exceptions is to be found at Lisleville, N. C., where the Southern Products & Silica Co. is producing various grades of silica sand from raw materials taken from the stock-piles of W. R. Bonsal, Inc., a sand-and-gravel producer.

The silica company, a subsidiary of W. R. Bonsal, Inc. and the Charlotte Chemical Laboratories, Charlotte, N. C., built its plant in 1933. Its products include pulverized silica for the manufacture of acid-proof cement, pigments, scouring powders, filter sand and similar materials.

The W. R. Bonsal operations were completely described in the June 1, 1932, issue of PIT AND QUARRY. Little change has been made in these operations except that the concrete storage bins at the gravel plant were undermined by a slide late in 1932. The plant equipment was removed from these bins to a temporary timber framework and products are chuted direct to trucks or railroad cars for shipment or rehandling to stock-piles. The plant's capacity, about 150 tons per hr., is unchanged.

The pit is located about 1 mi. from the gravel plant and consists of high-grade silica sand and quartz pebbles. A Bucyrus drag-line loads trains of Western 8-cu.yd. side-dump cars which are hauled to the plant by steam locomotives. Water for washing purposes is stored in an artificial 4-acre lake near the plant. It is supplied to the plant at the rate of 1,700 gal. per min. by a Fairbanks-Morse high-pressure pump driven by a Fairbanks-Morse Type Y, 2-cyl., 100-hp. Diesel engine.

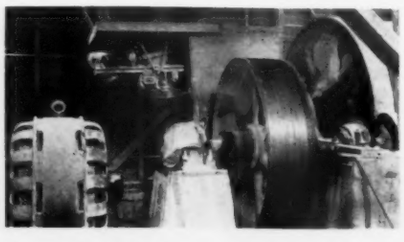
Pebbles of 2- to 6-in. size are hauled in cars to the grinding plant, a distance of about ¼ mi., where unloading is done by a crane. Preliminary reduction of the pebbles is effected by a Universal 12-in. jaw crusher set to ¾ in. and under. A 40-ft. Link-Belt chain-bucket-elevator discharges the crushed rock into a 20-ton timber storage bin. A Hardinge constant-weight feeder, operating at the rate of 1 ton per hr., supplies a 6-ft. Hardinge conical grinding mill, which is lined with blue granite and is charged with pebbles from the same deposit.



The 6-ft. conical grinding mill with feed bin in background and cyclone at right.

The pulverized product of the mill is discharged to a small rotary coarse classifier, the rejects going back to the mill. The fines go to a cyclone which discharges them into a 12-ton bin. A Clarage fan, driven by a 7½-hp. electric motor, furnishes the suction which carries the mill product through the cyclone and which also blows the coarse materials from the classifier and cyclone back into the mill. Material is sacked under the bin on a weighing beam. A 50-hp. electric motor drives all the plant equipment, with the exception of the fan, through a lineshaft and belt drives.

Dragline loading side-dump cars at sand-and-gravel deposit.



Constant-weight feeder with conical grinding mill at right.

The plant of the Southern Products & Silica Co. at Lisleville, N. C.

Loaded truck mixer being driven out from under the batching plant. Shovel in background supplies aggregate bins.

FLORIDA AGGREGATES FIRM ENTERS PREMIXED-CONCRETE FIELD AS BUILDING REVIVES

A NEW ready-mixed-concrete operation typical of many of the recent additions to this industry is that of the Rinker Rock & Sand Co., at West Palm Beach, Fla. This company has been in the rock and sand business since 1927. Early in 1935 the revival of building activity resulted in the establishment of a ready-mixed-concrete operation to meet the growing demand. At the same time the company added a line of reinforcing steel, lime, plaster, etc., so that it is now in a position to supply almost any building material desired.

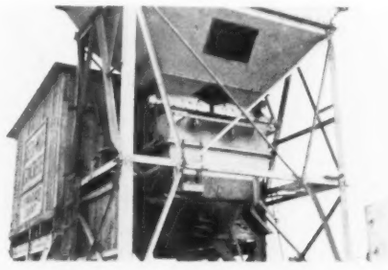
The company's yard is in an ideal location on the west shore of Lake Worth, alongside the bridge connecting the business centers of Palm Beach and West Palm Beach. This location makes it possible economically to serve both of these rapidly-growing communities. An indication of the success of this venture may be gathered from the fact that the two mixer trucks purchased early in 1935, soon proved inadequate. A third truck was purchased late in 1935 and plans are now to add additional units.

Coral rock is brought to the yard in barges, and is unloaded to stock-piles by a Northwest crawler crane with a 1-cu.yd. clamshell bucket. Sand is brought by trucks from the company's pit and dumped to stock-piles. The same crane is used to rehandle both sand and rock to the 50-ton, 2-compartment Blaw-Knox concrete batching plant bin. Aggregates are discharged from these bin compartments by means of segmental gates to a Blaw-Knox 2-cu.yd. capacity weighing batcher with a 2-beam scale. Mixer trucks are run under this bin, and first loaded with aggregates. On the batching floor is a 100-gal. water-measuring tank equipped with a gauge and fast cut-off valve. The truck moves a few feet to a point under this tank to receive the measured amount of water, and is then again moved a few feet ahead under a box through which sacked cement is added. The cement-storage house is located alongside the batching plant, and one man handles the entire batching operation. Under this arrangement it now takes about 5 min. to load a truck. This system is to be altered so that all three concrete ingredients will be fed to the truck at one point, and loading time is expected to be cut down to about 1 min.

The two original truck mixers are Chain Belt Rex 1½-cu.yd. units mounted on Chevrolet truck chassis. The third unit is also a Rex 1½-cu.yd. unit, but is mounted on a General Motors truck and

(Continued on page 66)

The second gasoline crawler crane used for rehandling to truck-loading bin.



Close-up view of aggregate-weighing batcher with cement shed in background.

General view showing batching plant, the two cranes and the truck-loading bin.

THE BEHAVIOR OF BITUMEN-AGGREGATE MIXTURES UNDER MOVING WHEEL LOADS

By HERBERT F. KRIEGE, Ph.D.
and LEROY C. GILBERT, C.E.

France Stone Co. Laboratories

A LARGER tonnage of mineral aggregate is finding its way into bituminous-road construction annually due to at least four trends, namely: (1) the ever-increasing mileage of bituminous pavements of primary and secondary systems, (2) a definite shift to coarser aggregate gradings in bituminous-road construction, (3) a reduction in the cost of construction of many "black-top" types, and (4) the erection of bituminous mixing plants at many aggregate plants. As a result, problems of the production of bituminous mixes and of the design and construction of bituminous roads have come home to the mineral-aggregate producer in no uncertain terms. Difficulties which may arise out of the lack of fundamental knowledge concerning bituminen-aggregate mixes can no longer be dismissed with a wave of the hand or passed on to the engineer or producer of bituminous cements for solution.

The realization of this responsibility on the aggregate industry led us in 1929 to begin investigations in the France Stone Co. Laboratories to determine and better understand the salient properties controlling the behavior of bitumen-aggregates mixtures in roads. It seemed very desirable to have a method of test based on moving-wheel loads which was capable of laboratory control and yet could be applied to field specimens as well as laboratory fabrications. Since no such apparatus and test methods were known, it became necessary to develop them. After considerable deliberation as to the type of test equipment to be used we felt that it must possess these qualifications:

(1) Have *moving loaded wheels* as deforming agents rather than static loads.
(2) Test relatively large *pavement specimens* as well as laboratory preparations.
(3) Give closely checking results on duplicate tests and specimens.
(4) Produce deformations which are easily and accurately measurable.
(5) Be small enough to allow accurate laboratory control of temperature, moisture, uniformity of sample, curing conditions, etc.
(6) Make the specimens very much like pavement samples in density, texture, structural strength, etc.
(7) Use, if possible, some equipment more or less standard in most established laboratories.

The resulting apparatus and test procedure will be described in some detail so that the producer or engineer interested in this investigation may follow each step without difficulty, and may use, if he so desires, the experiences we have gained to further his own study of the factors affecting the behavior of bituminous mixtures under traffic.

Before entering the discussion of our own tests and results it is proper to review briefly the work of earlier investigators and to define some concepts which may be new to many engineers and materials producers.

A very considerable amount of laboratory investigation has been done upon bituminous-aggregate mixtures in an effort to determine their so-called "stabilities." Such workers as Hubbard and Field,[1] Skidmore, Howe, Emmons and Anderton, Ulman, McNaughton, Besson etc., have led in this field and have made definite contributions through test methods and equipment. These methods have all been based on deforming, by the use of *static* loads, specimens which have been prepared in the laboratory. The apparatus and methods have been devised primarily for bituminous mixtures containing fine aggregates only. More recently, however, certain modifications, particularly in the size of the apparatus and specimen, have been introduced by several of these investigators with some success to allow the use of more coarsely graded aggregates.

It seems worth while to consider for a moment the term "stability." Stability is, strictly speaking, a *state* rather than a *property* of a substance or aggregation and as such is scarcely reducible to terms of loads and shears. The terms "structural strength" and resistance to deformation" are much more explicit and are measurable *properties* of materials and their combinations. It is entirely proper to speak of the structural strength of bitumen-aggregate mixtures. This is clearly recognized when we remember that the great effort which has been directed in recent years toward the improvement of bitumen-aggregate mixtures has resulted in the development of definite designed *structures* and *textures* of the aggregations. Gradations of aggregates, their characteristic angularities, surface features, strengths, and compactabilities certainly are contributing factors to the structural strength we have built into the bitumen-aggregate mixture. Likewise, certain properties of the bituminous ingredients, both as to quality and quantity, affect the structural strength of the mass or its ability to resist deformation.

[1] Hubbard (Prevost), American Society Municipal Improvements, 1925-6, p. 14.

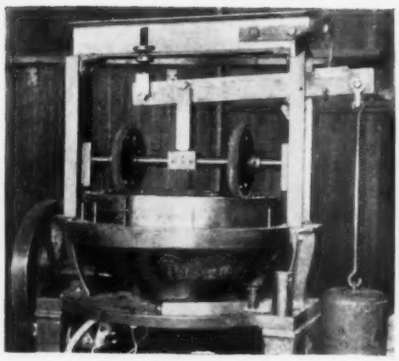


Fig. 1

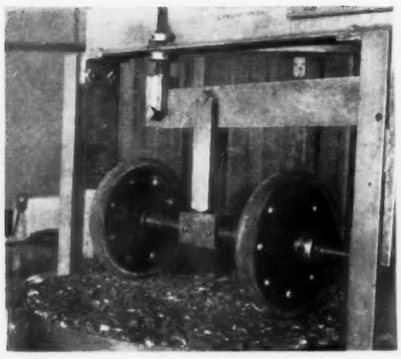


Fig. 2

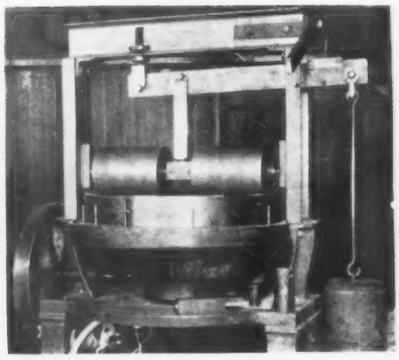


Fig. 3

Another angle worthy of consideration in the testing of these aggregations is whether the loading to be imposed upon a bituminous-aggregate structure should be static or moving. Static loadings alone have been employed in the laboratory investigations recorded previously to our own. The data thus acquired would certainly inform us regarding the abilities of the materials in question to resist such loadings as parked vehicles along the curb induce upon city pavements. To translate such data to resistance to deformation out in the traffic lanes of the same pavements is quite another matter. We all have seen evidence of deformation along the curbs produced by standing vehicles which are easily carried without deformation while they are in motion. Observations made with the apparatus described below emphasize the difficulties in trying to correlate static loads with resistance to deformation under moving-wheel loads.

Description of Apparatus.—The equipment which adapted itself most satisfactorily to the stringent conditions outlined above was the Dorry machine for determining the hardness of rock with the following changes. The machine, made by Tinius Olsen, was stripped of its spools, spool-holders and funnels, which are replaced by a frame consisting of two channel uprights and a connecting I-beam overhead. This frame supports an axle 1¼ in. in diameter, retained in vertical grooves in each end. Two rubber-tired wheels, 8 in. in diameter and 1 in. in width, of heavy metal disk construction, are placed on the axle, one on each side of the center and held in place by set collars (Figs. 1 and 2). Thus the wheels may be moved along the axle or retained at any desired point. The tires, while solid rubber, are similar to pneumatic tires in shape and action.

The loading is accomplished by means of a lever arm transmitting the load through a center post to the axle. The bearing points are knife edges and the base of the center post is fitted into the center block on the axle as a ball-and-socket joint. Center posts of two lengths are provided to allow adjustments for differences in the thickness of specimens. The lever arm is adjustable for leveling by means of a vertical screw and is equipped with a spirit level. The wheel loads chosen for these investigations were taken from the maximum wheel loads allowed in Ohio projected down to a 1-in. width of tire. This value amounts to 300 lb. on each wheel as a maximum.

Since the carriage of the specimen rotates at a fixed rate of 30 r.p.m. the speed of the loaded wheels at each position is definite. Thus, for example, the speeds at the outermost or first position, the seventh, and the innermost, or twelfth, position are 1.8, 1.2 and 0.73 mi. per hr., respectively.

When compacting a specimen on the machine, 8 steel rollers, 6 in. in diameter and 2 in. in width, are substituted for the wheels, four on each side (Fig. 3). The specimen is placed, compacted and tested on a steel plate 24 in. in diameter and ¼ in. thick. The plate is laid on the steel base of the Dorry hardness machine and is held in place at two points by pins. A flexible steel band of 12-gage metal, 2 in. or 3 in. high, 22 in. in diameter, is placed on the plate and held in position by six vertical pins. The band is free to move between these pins, however, and does not give the specimen edge rigid support. The entire machine is housed within a small inside room built of Celotex. It is heated electrically to maintain the desired temperature during the test procedure.

Preparation of Laboratory Specimens.—The aggregate mixture is placed on a sealed plate (band to plate) loose and dry and the voidage is determined by inundating the aggregate with a measured amount of water. The procedure is repeated with the stone compacted by the rollers. (See Fig. 4 for an example of the pattern produced.) In the case

Fig. 4

of bituminous mixtures the batch is weighed out and mixed by hand on a metal mixing plate. The bitumen content is based on the true surface area of the aggregate determined previously by use of the senior author's method.[2] The mixture is then placed on the specimen plate of the test machine to the desired loose depth and compaced by increasing the roller load by stages of 1/10, 1/3, 1/2, and, finally, the full equivalent loading of a 10-ton roller. For the cold-laid types the first course or binder course is left for 24 hr., after which the top mixture is laid in the same manner. At each loading the specimen is given 6 revolutions under the roller. Compaction measurements are then taken. The specimen is now placed in the curing rack (28 days for cold-laid mixtures) at room temperature, with good ventilation

Fig. 5

and protected from direct sunlight. The voidage of the completed specimen when cured is obtained by the water method as described previously. Hot-mixed, hot-laid types are prepared similarly except for the omission of the prolonged curing period between courses and for the completed specimen.

Pavement specimens are secured by placing 1/4-in. steel plates 24 in. in diameter in the road base at any desired point. The bituminous mixture is laid and rolled over these plates in the regular field manner so that the entire thickness of the pavement (or, if desired, any one course) lies upon them. Later, the plates are cut out of the pavement or course and the holes are patched with the original mixtures. It is a pleasure to mention here that we have had splendid coöperation from contractors and engineers in this important matter of obtaining numerous typical and satisfactory road specimens.

Test Procedure.—After many preliminary tests to determine what increments of load, time and temperature produced a continuously growing loading effect, the following technique was developed for the routine test procedure. A photograph is taken of the specimen surface in its initially completed state. (See Fig. 5 for an example of the texture produced.) Fine lines are painted or drawn on the surface at the quadrant radii, the origins also being marked on the base plate. Profilometer readings of the initial surface are made at these lines.

The specimen is brought to and maintained at any desired temperature between 30 and 160 deg. F., the usual temperature stages being 75, 100, 125 and 140 deg. F., unless failure occurs at a lower stage. When the specimen is to be run at temperatures above 75 deg. F. (room temperature), it is heated in the apparatus with an electric radiant heater, 2 ft. in diameter, placed above the specimen. Thus, heating occurs from the *top down*, as in nature. We believe this to be an important phase of the test technique. A soaking period is given to allow the temperatures in the upper and lower portions of the sample to equalize. Temperatures are measured by means of several thermometers thrust to different depths into the mass. A small radiant heater is kept directed on the material during the test if necessary to maintain the desired temperature.

The wheels of the test apparatus are placed at the outermost position of the specimen and loaded with the 1/3 maximum wheel load (100 lb. per wheel). The plate is revolved for 1 min. (30 revolutions). Since the wheels are opposite each other, equally distant from the center, every location under the wheels receives 60 loadings during that minute. The wheels are then moved inward 1/2 in., or one-half the width of the tire. If any rutting tendency has developed, the next position of the wheels will then be on the inner rim of the depression. The deformation is thus progressively worked toward the center of the specimen, the wheels being set at 12 successive positions along the axle. The profile is then taken of the surface at the same radii as before the test and the procedure of 12 successive loadings is repeated with the 2/3 load, namely 200 lb. per wheel. If no failure occurs at either the 1/3 or the 2/3 loading, the procedure is repeated at the full load or 300 lb. on each wheel. This gives a total of 36 positions, each with increasing loading effect, at each temperature stage. All these steps are carried out at the successively higher temperatures until the specimen fails.

Failure occurs when the gradually increasing tendency to rut is suddenly greatly accelerated by a rupture of the surface resulting in the rapidly deepening rut and a gouging action of the wheels, preventing further operation of the test. The collapse is usually so rapid that the full cycle of 60 wheel impressions during the minute at that position can not be completed and the machine must be stopped. It may be said also that when such failure has occurred the structure of the specimen is so definitely destroyed that we have not been able to restore its original strength by any reasonable amount of heating and re-rolling. It is very easy to distinguish between the types of failure induced by deficiencies or excesses or bituminous material. The former is dry and raveling, the latter curling and shoving.

[2] Kriege (H. F.), *Rock Products*, vol. 32, p. 73-80, May 11, 1929.

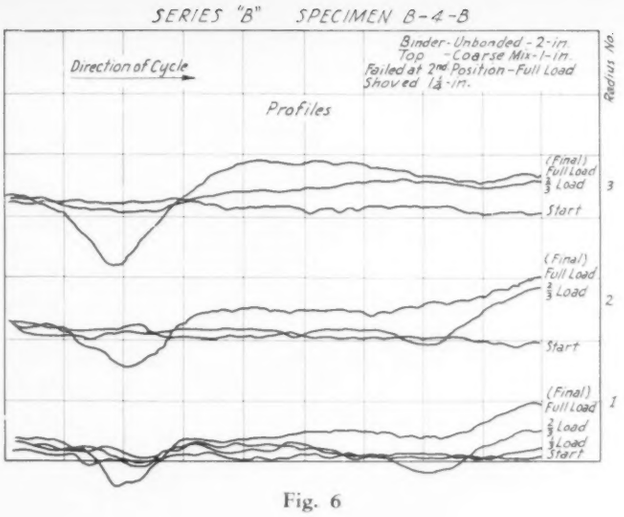


Fig. 6

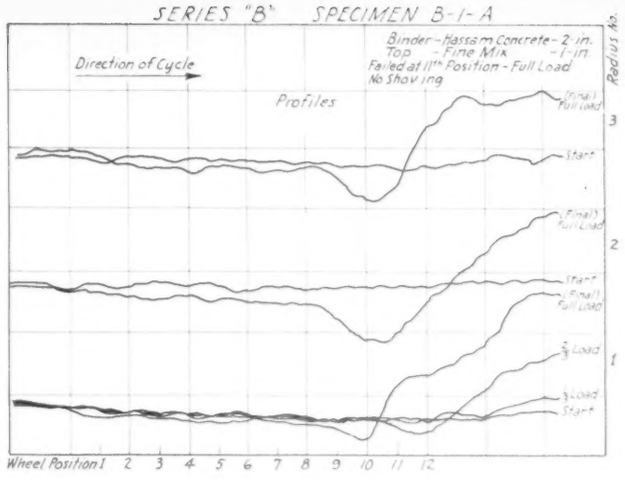


Fig. 7

After the specimen has failed, the final profile is taken. (See Figs. 6 and 7.) A photograph is taken of the surface and also of the section of the specimen sawed in two to register the kind and extent of the deformation produced and to determine if displacement has occurred in the top or in the binder only, or in both. (See Figs. 8 and 9.) The horizontal

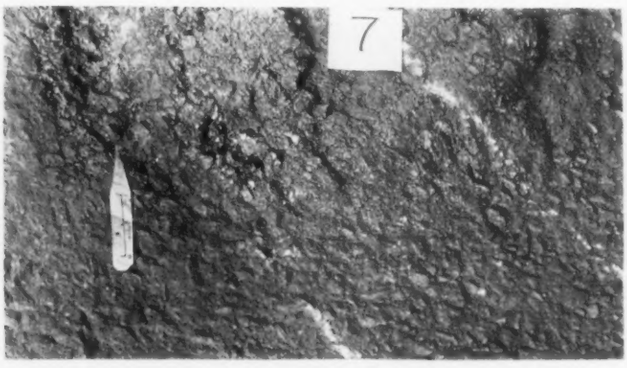


Fig. 8

displacement or shoving of the surface is determined by measuring the forward movement of the lines drawn initially at the quadrant radii.

The vertical deformation or rutting is traced by means of a profilometer consisting of a horizontal frame resting on the specimen and supporting a long-stemmed "T" with a pointer on the lower arm and a pencil on the upper. The pointer is tipped with a very small wheel, taken from a glass cutter, which follows each little vertical irregularity in the surface and transmits it directly through the pencil

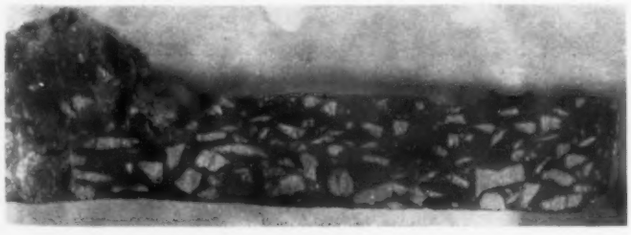


Fig. 9

to a sheet of cross-section paper mounted vertically along the track (Fig. 10). The depth and location of the deformations are thus accurately recorded.

When we began work with this test apparatus we purposely avoided any preconceived theses or notions as to the important qualities of bituminous mixtures. Rather, the doors were opened wide to any contractor, producer or engineer who had practical problems with bituminous mixtures and no way to solve them except the laborious, costly and time-consuming "road method." The response to our offer was great enough to give us a wide variety of materials, including road and plant mixes, tars and asphalts of the hot, cut-back, fluxed and emulsified varieties, bases, binders and tops of coarse-graded aggregate mixes as well as sheet asphalts and bituminous patch materials. Gravel, slag and stone coarse aggregates and natural and limestone sands as fine aggregates have been observed in these

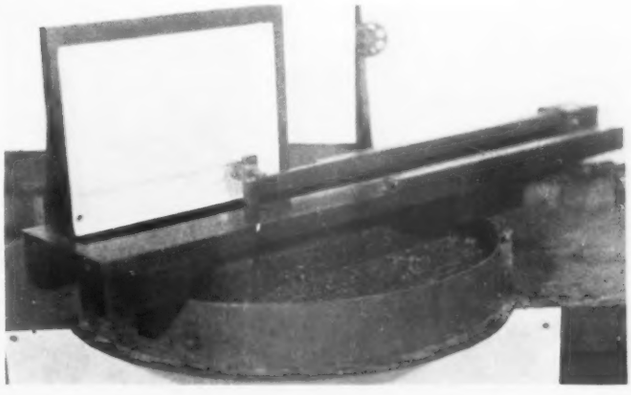


Fig. 10

mixes. It will be impossible to discuss more than a few of these in the present paper in their relation to some of the factors contributing to their behavior of such mixes under loaded wheel action.

It should be pointed out here and mentioned again that the purpose of the apparatus under discussion is to carry the loading conditions to the *failure* of the specimen. It is, then, something like the compressive strength test for Portland-cement concrete.

Narrow-tired wheels with relatively heavy loads were used, since it is plain to see by scars on any bituminous road that such traffic constitutes the worst threat against its permanence as a pavement.

Data.—Any apparatus or test method which is to be of value must demonstrate its ability to check its results satisfactorily on duplicate specimens. The following tabulation throws light on this matter, including a number of series containing duplicate or triplicate specimens fabricated under laboratory conditions and tested in our apparatus:

Series	*Kind of Mix*	*Number of Specimens*	*Wheel Positions at Failure*
C	Cold-mix top	3	2, 2, 3
T	Cold-mix pavement	2	12, 12
T-c	Hot-mix binder, top	2	12, 11
W	Fluxed hard asphalt, top	2	8, 9
P	Patch (tar)	6 (3 prs.)	7, 8 6, 6 7, 8
B	Hot-mix binder	3	9, 11, 10

In no case of duplicate specimens has the difference of wheel positions at the failure point been more than two, while commonly it is only one or actual coincidence. This fact constitutes a strong defense as to the uniformity of the technique of

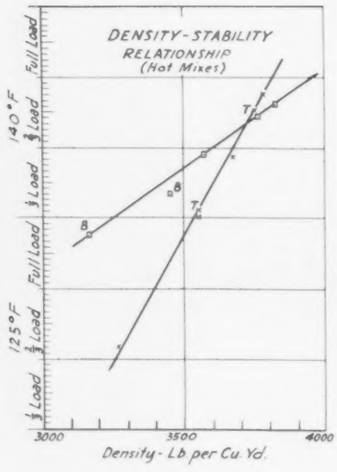


Fig. 11

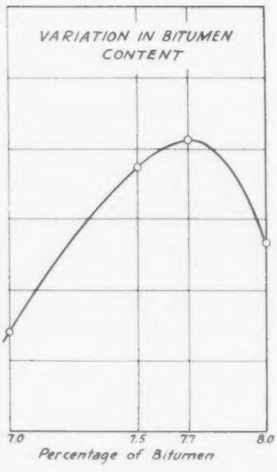


Fig. 12

preparation of specimens as well as the test procedure and of the concept of such aggregations having definite structural strength.

Factors.—(1) One of the most generally accepted qualifications of bituminous mixes for good behavior is *compaction*. The State of Ohio has made a definite effort to determine the extent to which bituminous materials are consolidated in the pavement by means of pan samples of the newly-laid compacted material in the road. We have done the same with our plate specimens 22 in. in diameter and the thickness of the pavement or any desired course. The relation between the compaction as measured by the weight per cubic yard and the ultimate stability or structural strength can best be shown with the diagram, Fig. 11. It should be noted that while some were tamped and some rolled, the structural strength of these road specimens was in linear relation to their *compaction*, as measured by their weight per cubic yard. The two curves represent specimens taken from two roads of the same type (hot asphalt-Ohio-T-50 Type B) but with crushed stone and limestone sand from different quarries. This factor is of definite interest to the aggregate producer since it shows that those aggregate characteristics of shape, gradation, keying behavior, etc., which aid in compaction under roller action, have a positive effect on the structural strength of the bitumen-aggregate mixture.

(2) Another factor shown by the same pavement specimens in the foregoing chart (Fig. 11) is the *range* of compaction and strengths exhibited by samples taken from the same road section, the specimens in the upper curve having been adjacent to each other in the pavement and equally distant from the edge of the road. We have probably not visualized the extent of the variations occurring in our present bituminous pavements except by visual inspection as to pattern or texture. We do know, however, that when a road surface fails, it is commonly in isolated spots, at least at first, which fact leads us again to the thought of inequalities in structural strength which these tests have brought out. We are familiar with the same condition in Portland-cement-concrete pavements when uniformly good concrete has not been secured. It is, therefore, a situation which must either be cured or endured, as long as segregation and associated phenomenon are not eliminated.

(3) It is of interest to note how the quantity of bitumen present affects the structural strength of the mixture. Fig. 12 shows a representative series in this regard. The only variable in this series is the percentages of bitumen used. Evidently the bituminous material acts as a lubricant as well as bond, if present in excess. The place of this test method in determining the proper quantity of bituminous cement to use with given fine and coarse aggregates is unique in that it establishes clearly the proper mix for maximum structural strength, is free from the personal element, and can be determined before the job begins as well as any time thereafter, when used as a control test. Such information is vitally interesting to materials producers, contractors and engineers.

(4) One factor which came up early for consideration was the effect of 10 to 15 per cent. of limestone fine aggregate ($\frac{1}{8}$-in. to dust) as a bitumen carrier on the structural strength of the whole mix. The results pointed in every case to a marked increase in strength with the fine material present. This appeared to have not only a stabilizing effect on the asphaltic material but a wedging action preventing the easy displacement of the coarse-aggregate particles from their original position. With this information a plant operator was able to meet a requirement of high bitumen content without fear of reducing the structural strength of the finished pavement.

(5) Aggregation strength as a characteristic of bituminous mixtures has proved to be in many cases and types the controlling factor of the strength of such mixtures, both in early deformations and in the ultimate failures under controlled conditions.

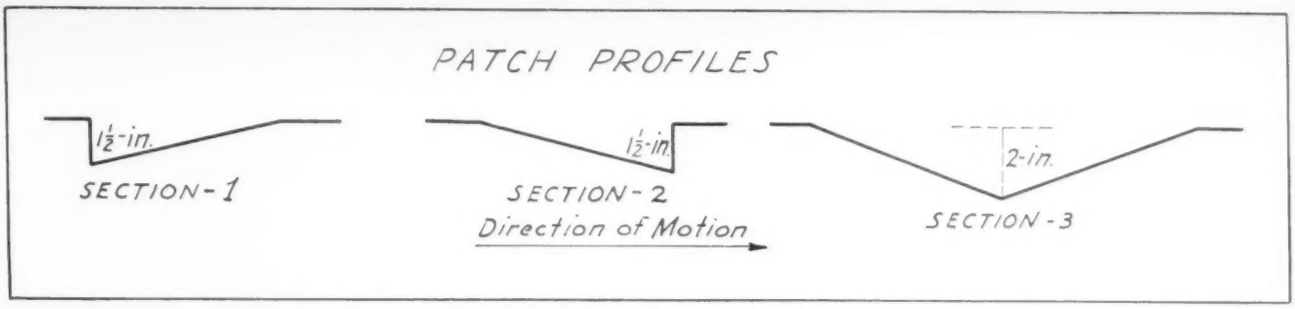


Fig. 13

Therefore, any factors contributing to the strength of the aggregate arrangement such as gradation, shape, surface and strength of the aggregate particles must in turn have their effect upon the structural strength of the mass. This fact is quite obvious, since in bituminous mixes we are dealing with a cementing material of the non-rigid type. The relative importance of these aggregate characteristics upon bituminous mixtures containing them will be discussed in a later paper.

(6) It has been interesting to follow the behavior in our apparatus of the same materials placed as patch mixes in holes of different shapes in a base of Portland-cement concrete. The several shape studies can best be seen in Fig. 13.

The following results accrued from a dozen or more determinations of various bituminous patch materials. In every case the mix in Hole No. 2 (Fig. 13) was most resistant to deformation, Hole No. 1 was next and Hole No. 3 last. The average superiority of Hole No. 2 over Holes No. 1 and 3 was 7 and 11 wheel positions, respectively. Since duplicate patches of the same mixes checked within one position, these observed differences must be real. The shape of the opening into which bituminous patch material is placed is thus shown to be a very definite factor in its resistance to displacement under traffic. This factor has not been recognized sufficiently, or at all, heretofore in maintenance work.

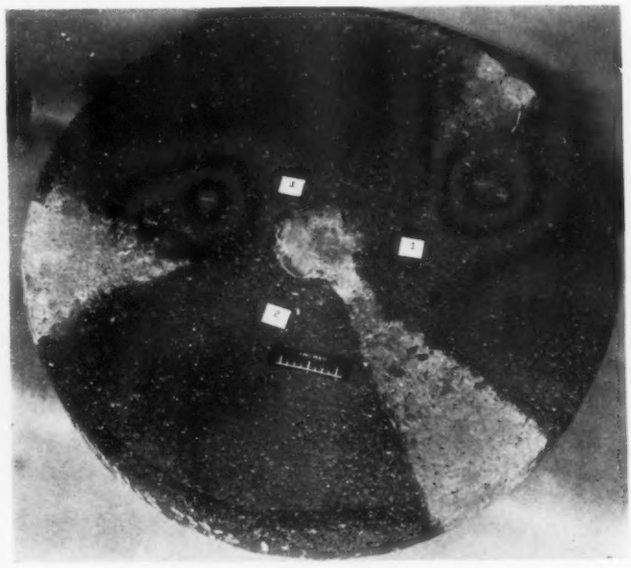


Fig. 14

Since most holes appearing in a road surface are given some shape in preparation for the patching, it is no more difficult and surely well worth while to shape them in the best manner, namely, like Hole No. 2, with the feather-edge toward the approaching traffic and the rigid wall at the back of the patch.

The obvious reasons for the superiority of shapes No. 2 over 1 are the rigid support at the back to prevent shoving and the absence of a bump as the wheels come upon the front edge of the patch. In shape No. 1 the wheels coming from the rigid pavement upon the thickest portion of the patch soon develop a depression, which, upon deepening, produces a distinct impact and the rutting action is accelerated. With no back wall to prevent shoving the patch is soon shoved out of the hole in the direction of the traffic.

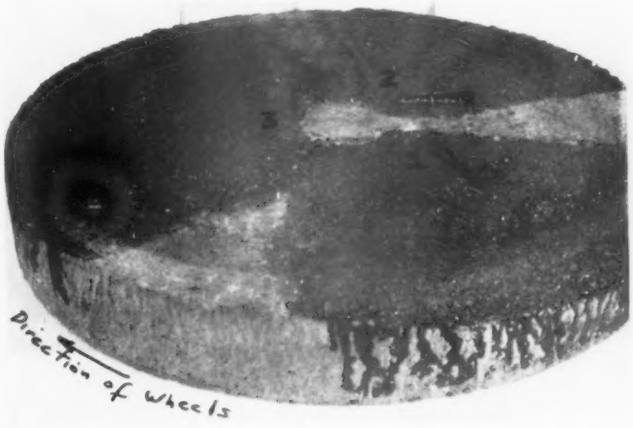


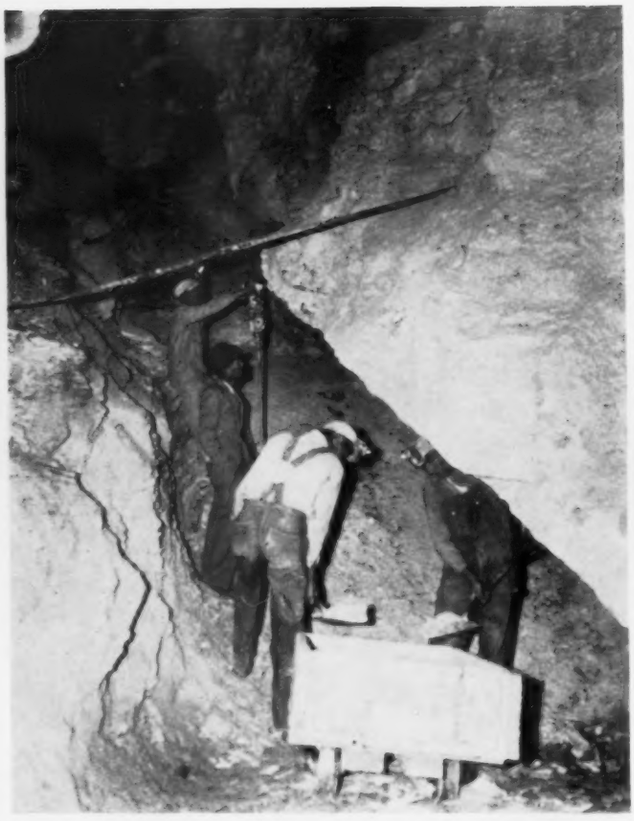
Fig. 15

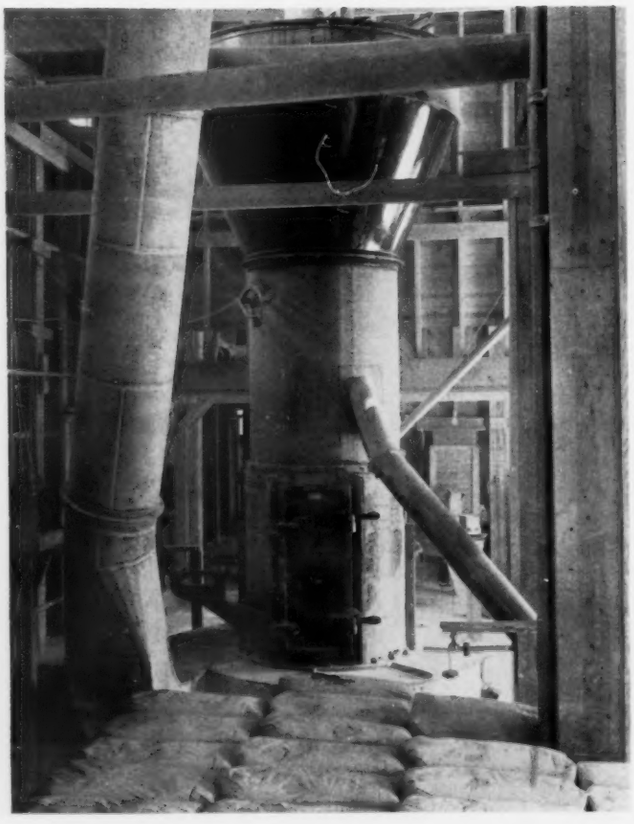
In the case of Hole No. 3, with a double feather-edge, the creeping occurs, since the patch lacks support at the rear. Also the rutting tendency is increased because of the greater depth arbitrarily chosen (2 in. compared with 1½ in. for the other holes) and primarily because of a longer area of the greater depth. The deepest rutting occurs in the area of the greatest depth, displaced slightly forward due to the shoving action. Two illustrations, Figs. 14 and 15, are included to show the arrangement of the patch specimens and their behavior under moving wheel loads.

In conclusion, we have described a new laboratory apparatus for the study of the resistance of bitu-

(Continued on page 66)

NEW PLANT





The four-roller high-side mill with super-separator above and duct from fan at left.

Above—Drilling and loading grinding talc. Saw talc above will be broken down later.

View of plant of the Southern Talc Co., at Chatsworth, Ga., showing facilities for truck and railroad shipments.

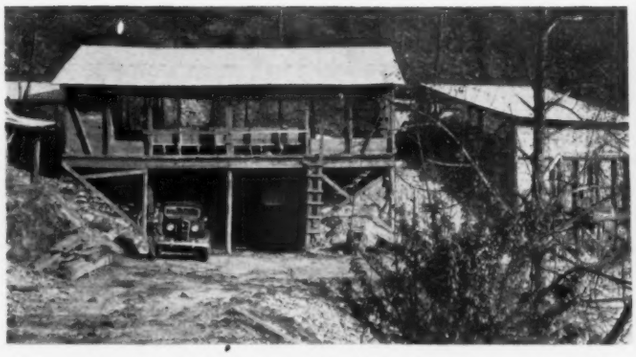
THE importance of Murray County, Georgia, in the production of talc was increased considerably late in 1935 when the new plant of the Southern Talc Co., at Chatsworth, Ga., was put in operation. Talc has been mined in Murray County for about forty years, the first commercial operation having been at Spring Place near Chatsworth. After a few years this plant was removed to Chatsworth and now Georgia's three plants are located there. Metal workers' crayon has been the chief product in the past and when ground talc was first marketed it was a by-product. The growing demand for this material, however, resulted in the installation in this new plant of grinding and sizing equipment for the production of any desired grade of ground talc. This plant is located on the main line of the Louisville & Nashville R. R. and is designed for the receipt of crude material either by truck or railroad.

The crude talc for this plant is now obtained exclusively from a mine located in the same deposit from which the other plants are supplied. This deposit is about 5 mi. long and averages 150 ft. in width with a depth varying from 3 ft. to nearly 100 ft. The saw talc in this deposit is in pockets from 2 to 10 ft. in thickness between lower grade talc used for grinding. The hard igneous rock above and below the deposit makes mining this material comparatively safe. The company also controls deposits of pure white North Carolina talc and chlorite in Cherokee County, Ga., known locally as micaceous talc which will be opened up and developed as soon as market conditions justify.

The mine supplying this new plant is about 2½ mi. distant by road from the plant. A ½-mi. road leading to the plant was built by the company along the mountain-side and this, as well as the state highway with which it connects, is downgrade to the plant. Hauling is done with two Chevrolet trucks

By W. E. TRAUFFER

IN GEORGIA TALC FIELD



Storage bins at mine where crude talc is loaded into trucks for haulage to the plant.

Crude storage room at plant where talc is dumped from trucks and fed by hand to conveyor.

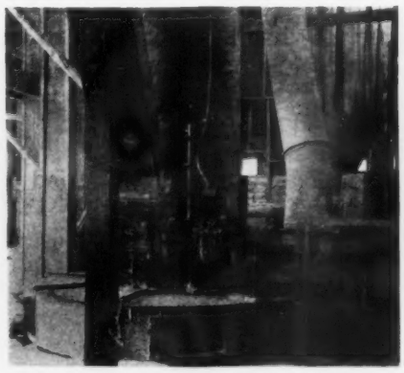
equipped with hydraulic dump bodies which carry about 4 tons to a load.

The mine has been extended about 400 ft. into the mountain and several drifts are being worked. Ventilation is provided by a shaft leading to the surface. Drilling is done with Ingersoll-Rand Jackhamers, and Trojan straight powder is used for blasting. In removing the saw talc only enough explosive is used to break down suitably sized pieces, but the grinding talc is shot to get better breakage. The talc is loaded by hand into 2-ton mine cars which are pushed down-grade to the mine opening, where the talc is dumped into storage bins having a total capacity of 175 tons. Trucks are loaded from the bins through chutes. The two trucks above mentioned and three men in the mine easily supply 50 tons øf material daily to the plant.

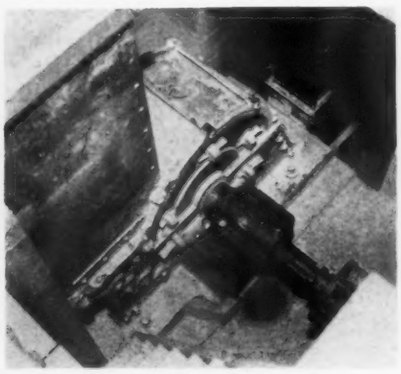
At the plant the trucks back into the crude storage room, where the talc is dumped in piles on the floor. About 400 tons of storage is available. The saw talc is then selected and laid aside near the crayon room. Sawing is done in the usual manner on saw tables, each having a facing saw and three trimming and sizing saws. About 100 gross of crayon of various sizes are produced daily. These are shipped in cases of twenty-four 1-gross boxes each.

The grinding talc is dumped by hand through holes in the storage-room floor to a 14-in. by 40-ft. belt-conveyor. This feeds the talc through a steel chute to a special hopper feeding a Williams No. 1 Jumbo Jr. hammer-mill which reduces it to ½-in. size and under. A Link-Belt steel-inclosed chain-bucket-elevator on 49-ft. centers feeds the crushed talc through a spout to a 50-ton timber storage bin, from which an automatic rotary feeder discharges it into the Williams 4-roller high-side mill. Only two rollers are now being used, as the full capacity of the mill is not required. Grinding is done to order for various grades of ground talc ranging from 98 per cent. through 200-mesh to 99 per cent. through 325-mesh.

The 7-ft. diameter Williams Super-Separator forming the top of the mill is adjusted to draw out any desired amount of fines. The draft from a Clarage No. 1 fan at the top of the building enters

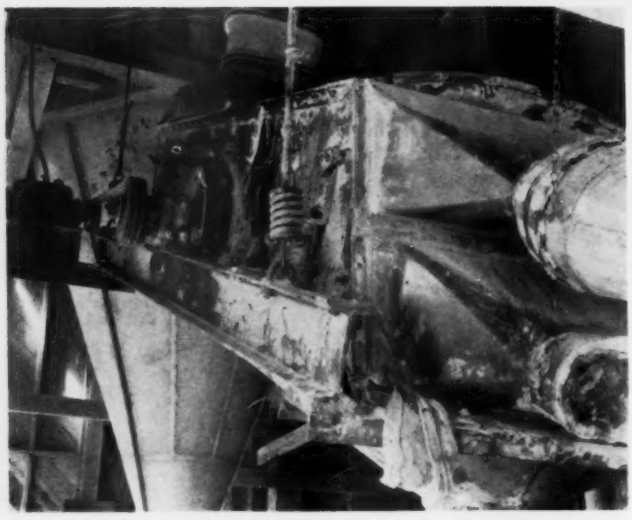


Another view of grinding mill with feeder at left. Bag collector in right background.



The primary hammer-mill. Elevator to grinding-mill feed bin in background.

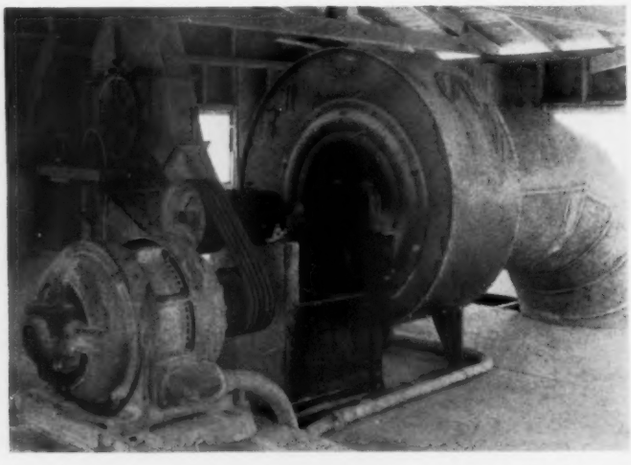
Bagging various sizes of ground talc from spouts. Weights are checked on scales.



The fully-inclosed double-deck vibrating screen which sizes coarse products. Cyclone in background.

the mill and carries the fines from the separator to a 9-ft. diameter cyclone which discharges the separated fines into a storage bin. The air from the cyclone with its extremely fine suspended dust is passed through a 35-ft. by 5-ft. 6-in. diameter Williams bag-type dust-collector. The collected dust, which is usually finer than 99 per cent. through 325-mesh, is bagged from the base of the collector.

The coarse material coming from the mill separator is discharged through a spout to a Link-Belt 60-ft. steel-inclosed bucket-elevator. This material is discharged on a fully-inclosed 42-in. by 10-ft. Williams double-deck vibrating screen hung on cables. At present only one deck with 35-mesh



The fan which supplies draft for air-swept grinding mill. One of bucket elevators in background.

cloth is used. The oversize is chuted to the mill-feed bin and the minus 35-mesh product is chuted to storage bins as granules for roofing, etc. There are two 25-ton bins for the finely ground talc with spouts for filling 50- or 200-lb. bags. The two 25-ton bins for granules are equipped with spouts for packing 100-lb. bags and also have collapsible side spouts for the bulk-loading of box-cars. Double-wall paper bags are used in the 50- and 100-lb. sizes while the 200-lb. bags are of burlap.

The plant's grinding capacity averages about 50 tons daily. Sacks are weighed on Howe platform scales fitted with Exact Weight indicators.

Since the plant went into operation a dust-collecting system was connected to the crusher and the saw tables. This consists of a Sturtevant fan and a cyclone made by the Chattanooga Blow Pipe Co. The fan is driven by a 5-hp. motor. This system, together with the full inclosure of all other equipment in the plant and the dust-collecting system connected to the fine grinding department make this plant as nearly dustless as possible.

The plant was designed and all equipment furnished by the Williams Patent Crusher and Pulverizer Co. V-belt drives are used wherever possible. The hammer-mill is direct driven by a 25-hp. G.E. motor and the roller mill through Texrope and flat belt by a 50-hp. G.E. motor. The belt-conveyor and bucket-elevators are driven by 3-hp. G.E. motors and the Clarage fan by a 40-hp. G.E. motor and Texrope drive.

Bitumen Mixtures (from page 63)

men-aggregate mixtures to moving wheel loads which lends itself readily to direct comparison between bituminous types of pavements of widely differing characteristics as well as the determination of the effects of these characteristics upon the behavior of bitumen-aggregate mixtures in the road. It has been pointed out that the concept of *structural strength* of such mixtures is more accurate and useful than the commonly used term *stability*.

We have discussed briefly a few of the factors controlling the behavior of bitumen-aggregate mixtures under traffic conditions. It has been shown that the responsibility of acquiring new information lies with the aggregate producer as well as with the other producers, contractors and engineers involved in bituminous-road construction.

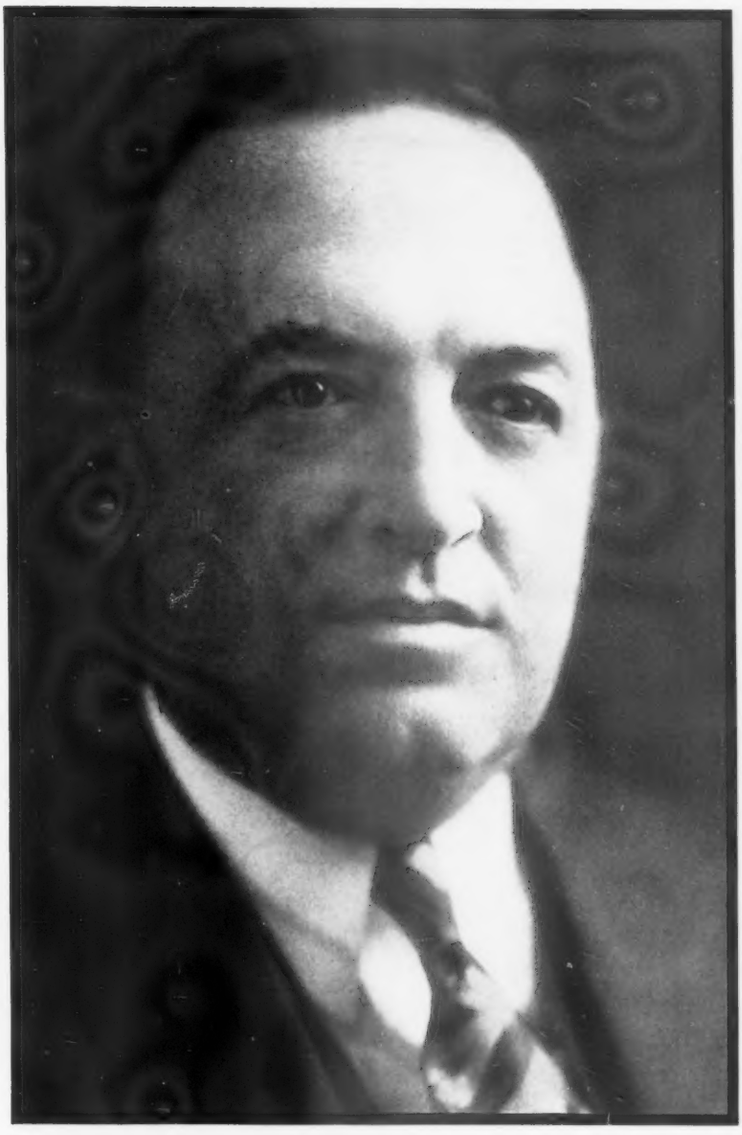
Rinker Rock (from page 57)

is equipped with a Jackass hoist. All have individual LeRoi gasoline engine drives for the mixers. According to W. D. Rinker, the Jackass hoist is invaluable for pouring in comparatively inaccessible places. The 1½-cu.yd. mixers are actually used as 2-cu.yd. mixers, and are rotated during loading to hold this amount of material.

With this equipment it has been possible to deliver 100 cu.yd. of concrete in a 10-hr. day. Most of the product is now used in the construction of private homes in Miami Beach, sea walls, etc. According to Mr. Rinker the demand so far this year has been three times that of the same period in 1935, and the production for the full year of 1936 is expected to be more than double the 1935 output.

This company also operates a fleet of Ford, Chevrolet and General Motors dump trucks for the delivery of aggregates. These trucks are loaded from a separate Blaw-Knox 50-ton 2-compartment bin. An old Northwest crawler crane handles aggregates to this bin from the stock-piles.

MEN of the INDUSTRY



J. L. SHIELY

BEFORE organizing his own company at St. Paul, Minn., for the production of aggregates in 1914 Mr. Shiely was engaged in the contracting business. This concern, the J. L. Shiely Co., Inc. and its subsidiary, the Guaranteed Concrete Co., have built up an enviable reputation in the production and sale of sand and gravel, crushed stone, agricultural limestone, lime-mortar and ready-mixed concrete. Mr. Shiely also built and operated eight plants for the Great Northern Railway to supply ballast for the road's entire system and another which furnished aggregates for the building of the eight-mile Cascade Tunnel on the Great Northern. At present Mr. Shiely's company together with the Becker County Sand & Gravel Co. is engaged in supplying 4,000,000 cu. yd. of screened toe gravel for the Fort Peck Dam. Active in the affairs of the National Ready Mixed Concrete Assn. since its formation, Mr. Shiely is this year serving as its president.

Personal Mention

Warren Lewis III, assistant to the late Charles P. McLane, general superintendent of the Longview-Saginaw Lime Works, Inc., Birmingham, Ala., has been appointed acting superintendent. Mr. McLane, who had served the company faithfully for 41 years died last February of pneumonia. After finishing his course in chemical engineering at the University of the South, Sewanee, Tenn., Mr. Lewis worked in the pipeline construction department of the Southern Natural Gas Co. later joining the lime company.

John M. Palmer has been made vice-president in charge of sales by Marblehead Lime Co., Chicago, Ill. He has been in charge of the company's Kansas City office.

W. O. Snyder, formerly chief engineer of the Kentucky State Highway Commission, has been named field engineer with headquarters at Frankfort, Ky., by the Portland Cement Assn. **A. W. Rohlwig,** field engineer at Louisville, has been transferred to Indianapolis, Ind.

W. D. Sankey, Jr., has been appointed assistant sales manager of the Lone Star Cement Corp. Alabama, Birmingham, Ala., succeeding Lewis Lloyd.

George E Trembly, field engineer for a number of years in the Chicago district office of the Portland Cement Assn., has been appointed regional highway engineer for the central states.

James E. DeLong, vice-president of the Waukesha Motor Co., who succeeded the late H. L. Horning as general manager, has been elected president. **James B. Fisher,** chief engineer of the company, was elected vice-president. Mr. DeLong's association with the Waukesha Motor Co. dates back 13 years, when he joined the company as field engineer in the development of the company's products for the oil industry. Mr. Fisher entered the Engineering Department as chief of design in 1914, and has been connected with the company since that time.

G. B. Gaylord, who has been associated with the Sierra Magnesite Corp., Gustine, Cal., recently sailed for Morococha, Peru, where he has accepted a position with the Cerro de Pasco Copper Corp.

C. H. Goggin has been placed in charge of the new Chicago office of Paul O. Abbe, Inc., Little Falls, N. J., maker of ball and pebble mills. The office is located at 407 S. Dearborn St.

L. A. Wagner, formerly connected with the Bureau of Standards, Washington, D. C., and inventor of the Wagner Turbidimeter, has accepted a position as research chemist with the Missouri Portland Cement Co., St. Louis, Mo.

W. W. Bradley, chief mineralogist of California, has recovered from injuries sustained a short time ago in an automobile accident.

D. R. Judd, sales engineer on the Pacific Coast for the Hardinge Co., has resigned to become affiliated with the Joshua Hendy Iron Wks., San Francisco, Cal.

Alfred Anderson who has been connected with the plant of the Inland Lime & Stone Co., Port Inland, Mich., has been transferred to Crosby, Mich., to become superintendent of the Armour No. 1 iron mine of the Inland Steel Co.

Frank E. Town, superintendent of the Manitowoc Portland Cement Co., Manitowoc, Wis., served as general chairman at the ninth annual Fox River Valley and Lake Shore Safety Conference held May 21, 1936, at Manitowoc.

Robert W. Wilson, superintendent of the Arlington, O., plant of the National Lime & Stone Co., has been promoted to the superintendency of the Ohio Blue Limestone Co., Marion, O., a subsidiary of the National Lime & Stone Co.

Stuart M. Perry, operator of a small crushed-stone plant at Winchester, Va., recently moved his operations to a new deposit located about four miles west of the town. Included in the new equipment installed in relocating the plant were a wagon drill, a Blaisdell air-compressor and a Fairbanks Morse scale.

Thomas Robins, Jr., has become president of the Hewitt Rubber Corp., leading producer of industrial rubber goods. He is the son of the inventor of the troughed belt conveyor and is a director and vice-president of the Robins Conveying Belt Co.

Paul E. Piersol has been placed in charge of the new San Antonio, Tex., office of the Marion Steam Shovel Co.

Oliver W. Morton, purchasing agent for the American Hoist & Derrick Co., St. Paul, Minn., has resigned after having been identified with the company for the past 36 years. He is being succeeded by **R. T. Reilly,** who has been with the company for the past 34 years.

Clarence B. Randall, president of the Inland Lime & Stone Co. and vice-president of the parent concern, Inland Steel Co., addressed the Chicago Assn. of Life Underwriters at a meeting held May 12, which opened Life Insurance Week.

J. M. Dannelly, Jr., who has been sales manager of the National Cement Co., Birmingham, Ala., has been promoted to vice-president in charge of sales.

A. J. Lindquist has joined the staff of the Cement Gun Construction Co., Chicago, Ill. He was formerly connected with the McDonald Engineering Co., cement-mill designers.

L. W. Grothaus, formerly assistant to the president of the Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has been elected a vice-president.

George W. Burrell, president, Wellman Engineering Co., Cleveland, O., has been elected president of the Cleveland Chamber of Commerce.

D. G. Reeder is in charge of the new sales and service branch at 2415 Commerce St., Dallas, Tex., of the Chicago Pneumatic Tool Co.

Additional Personal News Will Be Found on Page 75

Henry P. Stewart, Jr., age 40, an official of the Stewart Sand & Material Co., Kansas City, Mo., died May 9 at Emergency Hospital, Kansas City, following an operation for appendicitis. After attending Yale University he enlisted in the Canadian Air Force, receiving his commission as captain and serving overseas until the close of the World War. After joining the General Motors Corp., where he became director of service of the Fisher Body Corp., he returned to Kansas City to enter the business founded by his father. A widow and two sons survive.

George G. Ziegele, president of the Peoria Concrete Construction Co., Peoria, Ill., died May 11. He was 48 years old and had been identified with the sand-and-gravel and concrete-products industries of Peoria for nearly 20 years.

Albert F. Bemis, 65, chairman of the board of the Atlantic Gypsum Products Co. and of the Bemis Bro. Bag Co., died recently at Phoenix, Ariz., of injuries suffered in a fall while he was vacationing on the desert.

James S. Handford, 83, an executive of the Batesville White Lime Co., of Batesville, Ark., died recently. He had been in business in Batesville for 50 years.

William Palmer, superintendent of the Fredonia, Kan., plant of the Consolidated Cement Corp., died May 3 in a hospital at Chanute, Kan., at the age of 62 years. He was a native of Elk Falls, Kan., and early in his life was closely connected with the construction industry in Kansas. He became a foreman of the Fredonia Portland Cement Co. in 1909 and remained with the company after its acquisition by the Consolidated company, having become superintendent 18 years ago.

D. M. Filler, age 60, vice-president and general manager of the Urbana Sand & Gravel Co., Urbana, Tex., died recently. He had been connected with the concern for the last 20 years and was well-known in the industry through Texas and the southwest.

Charles A. Homer, 70 years old, vice-president of the Missouri Portland Cement Co., died suddenly following an attack of acute indigestion at his home in Universal City, Mo., St. Louis suburb, on May 6. He had just returned to his home from a business trip to Kansas City when he was stricken. Mr. Homer joined the sales staff of the Union Sand Co., predecessor of the cement company, in 1903. He became secretary of the company shortly after its formation and has been vice-president for 15 years.

J. C. Van Doorn, former sales manager, Universal Atlas Cement Co. and for more than three decades connected with that company, died May 13 at Minneapolis, Minn. He began his work with the cement company in 1903 as sales agent at St. Louis, Mo. In 1907 he became sales manager at Minneapolis, which position he held until last October when he asked to be relieved of his duties under the pension plan of the company.

. . . . Traffic News and Comment . . . . .

Legislation

Fourth Section—The Interstate Commerce Committee of the Senate began hearings on May 11 on the Pettengill Bill to amend the fourth section of the Interstate Commerce Act. This amendment would eliminate the long- and short-haul clause which provides that carriers can not charge more for hauling freight or passengers over a shorter distance than over a longer distance, the short haul being included within the limits of the long haul.

This legislation was originally brought about by the railroads reducing the rates from eastern United States to the west coast to meet the competition of water carriers operating between the eastern seaboard and Pacific coast points. In making these reductions rates to intermediate destinations, particularly in intermountain territory, were not reduced, so that the rates from the east to destinations in intermountain territory were higher than the rates from the east to points on the Pacific coast. Again in the case of a railroad having a circuitous route between two common points the rates between these were reduced to meet competition of the rail line having a direct route without reducing the rate from the point of origin to intermediate points which were only served by the one carrier. This bill has passed the House of Representatives and is favored by the railroads, railroad labor and shippers generally. Opposition to the bill comes from shippers in intermediate territory and from the intercoastal steamship lines. Chairman Wheeler, who presided at the hearing, is from the intermountain territory. Unless the bill is passed by the Senate before Congress adjourns it will be "dead" and would have to be reintroduced in both branches of Congress next year. Opponents of the bill stated that from 50 to 75 witnesses would appear in opposition and that the hearings might run four or five weeks. Some opposition to the bill also developed among trucking interests as enactment of this bill into law would make it less difficult for the railroads to meet some of the truck competition. The National Industrial Traffic League was represented by J. P. Haynes who stated that the League had been unanimous in approving this bill.

New Complaints Filed

Lime—New rates and reparation are sought on an allegation of unreasonable rates on lime from Milltown, Ind., to South Charleston, W. Va., in a complaint filed by J. V. Norman, Attorney, Kentucky Home Life Bldg., Louisville, Ky., in I. C. C. Docket No. 27,409, Louisville Cement Co., Louisville, Ky. *v.* C. & O. *et al.*

Sand—Alleging violation of Section 1 reparation is sought in connection with the rates on sand, processed or unprocessed, from points in New Jersey and New York to Baltimore, Md., in complaint filed by John T. Money, Attorney, 801 Mills Bldg., Washington, D. C. in I. C. C. Docket No. 27,301, Sub. No. 1, Kennedy Corp. *et al*, Baltimore, Md. *v.* Pennsylvania *et al.*

Reparation is prayed for on an allegation of violation of Section 1 in the rates on moulding sand from Schuylerville, Ushers, Elnora and Wemple, N. Y., to Peoria, Ill., in a complaint filed by R. W. Schapanski, Fruit Dealers Bldg., South Water Market, Chicago, Ill. in I. C. C. Docket No. 27,388, Hart-Carter Co., Peoria, Ill., *v.* B. & M. *et al.*

The rates on sand from Polk and Utica, Pa., to destinations in Pennsylvania and New York are alleged to be in violation of Section 1 and new rates are sought in complaint filed by Edwin Brooker, Muncie Building, Washington, D. C., in I. C. C. Docket No. 27,398, Industrial Silica Corp., Youngstown, O. *v.* Erie *et al.*

The rates on sand from Glenside, Pa., to Kalamazoo, Mich., have been attacked under Section 1 with a request for reparation in a complaint filed by R. W. Schapanski, Fruit Distributors' Bldg., South Water Market, Chicago, Ill., I. C. C. Docket No. 27,406, Reed Foundry & Machine Co., Kalamazoo, Mich. *v.* Reading *et al.*

Traffic News

Emergency Surcharges—Arguments before the Commission in re-opened Ex Parte No. 115, emergency freight charges, 1935, were scheduled from May 20 to 23. The emergency charges ordinarily expire on June 30 unless an extension is granted by the Commission before that time. The additional revenues provided by these charges are variously estimated to amount to between 80 and 100 million dollars annually with the railroads uniting in petitioning the Commission for continuance of these charges. Opposing the charges are shippers and various state utility commissions. Hearings on the reopened case began April 21 and various industries produced witnesses with statements and exhibits intended to show that the emergency charges should not be continued. Among the first to testify in the case was D. L. Warner of the Thomasville Lime & Stone Company at Thomasville, Pa. Testimony in favor of a continuance of the surcharge was introduced by a representative of railroad bond holders.

Pick-up and Delivery—On April 1, 1936, the tariffs of various eastern carriers proposing to establish pick-up and delivery service in connection with shipments of freight moving on less carload or any quantity rates at various origin and destination points in official classification territory without charge in addition to applicable line haul rates were suspended. These tariffs also proposed an allowance to shipper or receiver of freight at points where pick-up and delivery service is authorized where such shippers and receivers elect to perform their own pick-up and delivery service. This case has now been set for hearing in Washington on June 16. After these schedules were suspended the railroads asked for permission to publish pick-up and delivery tariffs effective on 10 days notice providing for free pick-up and delivery service but not making any allowance to the shipper who performed his own pick-up and delivery service. Various trucking companies and associations protested these schedules but the Commission issued a notice that these schedules would go into effect May 25, 1936, as published.

Dismissal Compensation—Committees of railroad management and railroad labor have reached an agreement as to compensation to be awarded employees who are dismissed by reason of the coördination of railroad facilities. Briefly, the agreement provides that when an employee is placed in a position paying a smaller monthly salary than he received before the coördination was effective that the difference must be paid by the carrier for a period not to exceed five years or until, through promotions or otherwise, the employee received a salary equal to or greater than that received prior to the coördination. When the employee is deprived of employment as a result of a coördination he is to receive a monthly allowance equivalent to 60 per cent. of the average monthly compensation he received for the twelve-month period prior to the coördination as follows: If he has been in service one year and less than 2 yr. the coördination allowance is to be paid for 6 mo.; for service up to 3 yr. the allowance is for 12 mo.; for service up to 5 yr. the allowance is for 18 mo.; for service up to 10 yr. the allowance is for 36 mo.; for service up to 15 yr. the allowance is for 48 mo.; for service of 15 yr. or over the allowance is for 60 mo. Where the length of service is less than 1 year a lump sum payment equivalent to 60 days pay is to be made. Any employee may, at his option at the time of coördination, resign and accept in lieu of all other pensions, a lump sum operation allowance ranging from 3 mo. pay for service less than 2 yr. to 12 mo. pay for service of 15 yr. or over. Employees are to be reimbursed also for expenses of moving including traveling expenses of himself and members of his family including living expenses during the time necessary for such transfer and is to be paid for any loss suffered in the sale of his home for less than its fair value or for any loss to the extent of a fair value of any equity he may have because of a contract to purchase a home or from an unexpired lease of a dwelling occupied by him as a home.

Motor-Vehicle Transportation — The Commission has found it necessary to issue a notice warning motor carriers that they must charge the rates which they have filed with the Commission and that these rates must be made available for public inspection. It has come to the attention of the Commission that some motor carriers are not collecting the rates lawfully filed and that some carriers have conflicting rates filed with the Commission and that other carriers do not have their tariffs posted for public inspection.

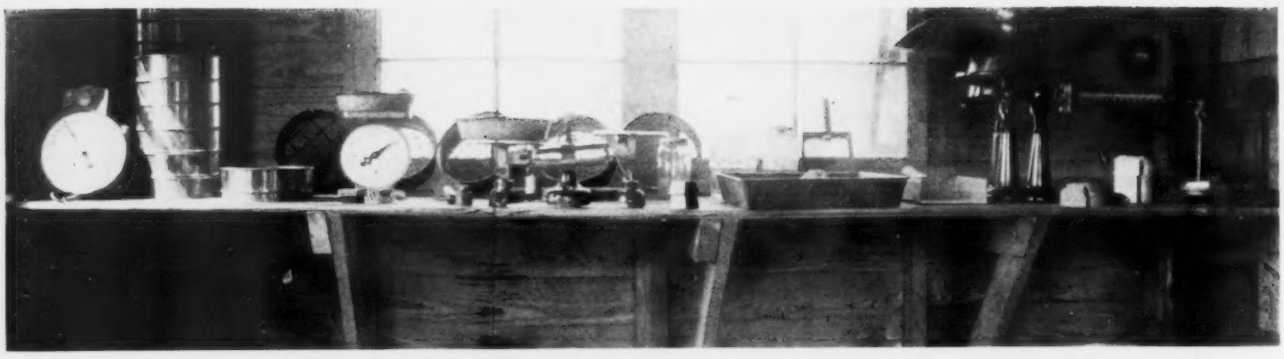
The first suspension order has been issued by the Commission's Motor Bureau being designated as Docket I & S M-1. The proposed schedules would reduce the rates on various commodities between points in Illinois, Missouri, Oklahoma, Arkansas and Kansas *via* Powell Brothers Truck Lines, Inc. In the case of railroad rates the protestants are generally shippers but in this case the protestant is the Midwestern Motor Freight Bureau of Kansas City, Mo., a motor tariff publishing agency. This protestant claims that the unduly low rates and charges if permitted to become effective will result in demoralization and elimination of adequate transportation service by any competing motor-carrier lines.

Coming Events

June 29-July 3, 1936. Atlantic City, N. J.—Annual meeting, American Society for Testing Materials.

July 9-10, 1936. St. Paul, Minn.—Semi-annual meeting, Board of Directors, National Sand & Gravel Assn., St. Paul Hotel.

October 5-9, 1936. Atlantic City, N. J. Twenty-fifth annual safety congress. W. H. Cameron, managing director, National Safety Council, 20 N. Wacker Drive, Chicago, Ill.



Shelf and testing equipment in new laboratory of Columbus Gravel Co.

Tests in Own Laboratory Assure Producer That Materials Meet Specifications

By A. P. CALDWELL
Secretary, Columbus Gravel Co.
Columbus, Miss.

OUR new field laboratory was built and equipped to allow us to meet the rigid specifications required for our product. Just as steel mills, cement mills and other industrial plants maintain laboratories to eliminate guess-work from their production, we have found that a lot of headaches and money are saved by using a laboratory to ascertain that we are turning out the material we set out to produce. In other words, it is folly to run the plant a day or even an hour and not be reasonably sure that we are producing a salable material. It is also folly to guess or hope that a car of gravel or sand meets specifications, ship it some 100 miles to a project and when it is tested on arrival discover that it does not meet the requirements. Then we have wasted time and money producing the material and are liable for the freight charges on the material as well. Two carloads of rejected material at the point of delivery will cost any producer more than the equipping of an adequate field laboratory.

Producers sometimes say that they know what kind of material a given series of screens in their plant will produce. This may be true in a crushed-stone plant, since crushed material usually is more or less constant. However, in the case of sand and gravel the deposit usually varies; that is, there are spots where large stones are prevalent, in another small pebbles may be excessive or in another the deposit may run 75 per cent. sand, and so on. Therefore, we are constantly forced to adjust our screens (or series of screens). Specifications are exacting and the naked eye can no longer grade sand and gravel, but with 15 to 30 min. in our field laboratory we can ascertain whether or not the material is coming through O.K.

Our laboratory represents an outlay of approximately $150 and is composed of the following equipment:

1 set of 12 Tyler standard screen scales (sieves) 8 in. in diameter and in sizes of 1½ in. down to No. 100 mesh.
1 set of gram balances, for use with sand.
1 set of Fairbanks-Morse aggregate scales, graduated in pounds and tenths of pounds, for weighing gravel.
1 No. 2 charcoal burner for drying sand or gravel.
8 black tin pans (biscuit pans) ranging in size from 15 in. by 16 in. to 7 in. by 9 in., all about 2½ in. deep.
1 cu.ft. box for determining weight by volume.
1 one-eighth cu.ft. box for the same purpose.
2 trowels.
2 sugar scoops.
Bags for taking samples, shovels, charcoal, small tables, brushes for cleaning screens, water bottles, etc.

Our office is located 2 mi. from the heart of the city, near our plant. The laboratory room was built as an addition to the office. It is 10 ft. by 10 ft. in size, of timber construction and was built in sections and bolted together so that it may be moved. It is well lighted, having five 32-in. by 24-in. windows. Built-in tables and benches for working space are provided. By using plant labor at idle times the laboratory was built for about $50, the screen-scale set cost approximately $50, and the two sets of balances cost about $45.

The idea for the laboratory grew out of the fact that on most important highway-department jobs, the department sent an inspector to our plant to inspect the material before it left the plant. On the smaller jobs they did not feel that a plant inspector was necessary, but they did insist that we ship material that conformed to specifications. The writer began gathering information on how to test material and the various tests that are usually made in field laboratories. We found that a sieve analysis, fineness-modulus test, weight-by-volume test, and a loss-by-wash test were the only items the department could check with the equipment they brought with them. Other tests, such as for abrasion, chemical analysis, percentage of voids and specific gravity, requiring expensive equipment, were found unnecessary since these conditions are more or less constant for a given type of gravel; that is, gravel meeting Specification G-6 will have practically the same percentage of voids and the same specific gravity. These tests, therefore, were not of vital concern. In gathering data for methods and means of making tests, we first tried to learn all we could from the various inspectors sent to our plant, correlating their information with that contained in bulletins from the U.S. Department of Agriculture, National Sand & Gravel Assn., the W. S. Tyler Co. and others.

The laboratory has more than paid for itself in that our percentage of rejected material has been reduced more than 75 per cent. It lends our company a certain prestige due to the fact that the highway department, contractors and other customers are convinced that we are making an honest effort to produce the material to meet specifications. It impresses the men at the plant. It makes them feel that they are not merely "gravel diggers" but producers of a high-type of building material and they pride themselves in being able to turn out a quality product.

Foreign Developments

Studies on Properties of Stone and Machine Wear

Studies of the physical properties of stones and the wear of metal machine parts show that the abrasive quality depends principally on the combined resistance to compression and resistance to impact. The principle of a crushing apparatus has much to do with the wear on the parts, according to whether there is impact and direct pressure, or rubbing movement, or combination of the two. As in grinding a metal it is necessary to use for a hard metal a hard and compact abrasive bedded in a comparatively soft binder, so that fresh grinding surfaces are constantly exposed, while for a soft metal it is advisable to use an abrasive which is hard in itself and is bedded in a harder cement, so in the case of drilling rock a compact rock will cause more abrasion on a hard metal than brittle rock, while a hard but brittle rock will cause more wear on a soft metal than a compact rock. A careful study of the properties of the rock will often give a valuable indication of the usage of wearing parts to be expected in quarrying operations. —E. C. Blanc in *Pierres & Minerais*, 7:1186-1189, January, 1936 (No. 76).

Rotary Kiln Produces Both Cement and Iron

The first actual installation of a rotary kiln for the simultaneous production of iron and Portland cement is at the cement plant of the Compania Asland at Moncada, Spain. The process employed is that known as the Basset process, and the apparatus a rotary kiln 45 meters long and 2.80 meters in diameter. The raw material, consisting of iron ore, limestone and reducing coal, finely ground and either moistened or in slurry, is heated in the first zone of the kiln to some 700 deg. C. Moisture and chemically combined water are driven off, and the combustion of the reducing coal as well as its action on the iron ore begin.

In the second zone the temperature increases to 850 deg. C. Reduction of the ore by means of the coal and the carbon monoxide arising from the combustion is continued. At the end of this zone the dissociation of the limestone and liberation of carbon dioxide begin.

In the third zone temperatures up to 1250 deg. C. are reached. The reduction is furthered by the great amounts of carbon monoxide originating from the dissociation of the carbon dioxide from the limestone. In this zone the combination of lime by the silicates and aluminates begins to make rapid progress.

The fourth zone (1400 deg. C.) corresponds to the sintering zone in Portland cement manufacture.

In the fifth zone the iron melts and separates from the Portland cement clinker, which now floats on top of the fluid iron (the temperature in this zone is 1500 deg. C.). At the end of this zone there is at one place in the kiln shell an opening, and at every revolution a quantity of the molten iron flows out this opening.

In the sixth and last zone the temperature falls to 1100 deg. C. Here the clinker is exposed to the fresh combustion air, oxidises and passes to a rotary cooler. Thence the clinker passes over a magnetic separator to remove metallic iron, and from there to clinker storage.

The cement so produced meets the Spanish standard specifications for Portland cement.—Patricio Palomar Collado in *Tonindustrie-Zeitung*, 60:-123-124, 141-143, Feb. 3 and 6, 1936.

Sedimentation Apparatus Suited to Plant Control

The approximate determination of the granulometric composition of cement, to the smallest dimensions of the particles which can not be distinguished easily by screening, can be considered a necessary control in ordinary manufacturing, in view of the importance of fineness in relation to the properties of the cement and in relation to efficient operation of the mills. The apparatuses which gave the greatest exactness in determining granulometric composition are the Gonnell air apparatus and the Wagner turbidimeter, but these devices require a long time to give a complete analysis and are even more precise than needed for plant control. The Kühl-Czernin sedimentation apparatus is sufficiently practical for current analysis in the plant laboratory, and in equivalent time (half hour or a little more) yields indications considerably more precise than the ordinary air fluorometers. A supplementary study will deal wtih the Andreasen pipette.—Dr. Vieri Sevieri in *Cemento* (Barcelona), 8:35-42, 67-71, February and March, 1936 (Nos. 81, 82).

Reaction and Equilibria of Magnesia in Clinker

From ternary phase equilibria of the components CaO, MgO, Al_2O_3 and SiO_2 the author derives the conclusion that magnesia can be combined along with lime with the acid oxides when after saturation of the silica to 2CaO.SiO_2 and equivalent amounts of alumina and iron oxide to 4CaO.Al_2O_3.Fe_2O_3 there is no longer sufficient lime at hand for the complete formation of CaO.Al_2O_3 or 2CaO.Fe_2O_3.

The dissociation of 2MgO.SiO_2 and 2CaO.MgO.2SiO_2 by lime, as well as the formation of 2CaO.SiO_2 and 4CaO.Al_2O_3 from the components in the presence of magnesia were investigated through reactions in the solid phase. The dissociation reactions progress through all intermediary stages that can arise in connection with the gradual increment of lime to the original products. In the formative reactions there occur along with the end products intermediary magnesia compounds (3CaO.MgO.2SiO_2 or MgO.(Al, Fe)$_2O_3$) in slight amount.

In Portland cement no compounds of magnesia can stand in equilibrium along with the high-lime minerals of the clinker; if such are present in the first instance they are so rapidly dissociated that under the conditions of burning of the clinker the state of equilibrium is reached.—H. zur Strassen in *Zement*, 25:218-221, April 2, 1936 (No. 14).

Book Reviews

STANDARD PRACTICES, *published by Diesel Engine Manufacturers' Assn. Distributed by Diesel Publications, Inc., 192 Lexington Ave., New York, N. Y., 162 p. Ill. Price $2.00.*

Although the general characteristics of all types of Diesel engines are essentially the same, the subject matter in the fifteen chapters of this new book deals primarily with the heavy-duty, low- and medium-speed engines of sizes that are commonly used in stationary power plants of around 200 hp. and larger.

The aim of this volume is apparently to help users, owners and operators to bring their Diesel background up to date so that they will be able to deal with Diesel power as efficiently as they have dealt with steam machinery in the past. The standard practices as outlined are up to date and extended, notes on the selection of engines are amplified, details in regard to plant lay-out are presented and coördinated with suggested forms for specifications, the economics of Diesel power are treated, and a standard field test code is included.

MINE PLANT DESIGN, *by W. W. Staley. Published by the McGraw-Hill Book Co., 330 W. 42d St., New York, N. Y. 386 p. 87 ill. Price $5.00.*

The author, assistant professor of mining at the University of Idaho, has provided in one volume material otherwise scattered through many sources. It is a practical discussion of the methods and procedure for selecting and designing underground and surface equipment and simple structures, with the exception of crushing and ore-dressing apparatus. The information contained therein will be of great help in analyzing requirements and in dealing with the recommendations of manufacturers' representatives.

Especially valuable are the many typical problems brought up and the illustrative examples of complete calculations, typical designs, etc., given for their solutions.

New Machinery . . . and Supplies

Core Drill Designed to Obtain Higher Percentage of Recovery

The accompanying illustration shows the latest development in core drills by the Reed Roller Bit Co. of Houston, Tex. The drill is designed so as to obtain a higher percentage of recovery as well as longer cores of larger diameters.

Roller-bearing core drill.

In the interest of simplicity and efficiency, all non-essential parts have been eliminated in this new type core drill. The inner barrel and core catcher are carried by the cutter head, permitting the taking of the core close to the bottom of the hole. The cutters in the hard-formation head turn on roller-bearings in the larger sizes and are made integral with the head by welding. This eliminates the chance of losing cutters in the hole as sometimes happens when they are supported only by pins. Hard-formation cutter heads with core catchers, and soft-formation cutter heads with core catchers, are interchangeable on the same barrel. Quite an economy is effected through this interchangeability.

The core-drill reamer, run immediately above the cutter head, is of particular advantage in the larger sizes of core drills, especially when the core drills used are of the same size as the drilling bits. The core-drill reamer not only keeps the hole out to full gage so that the drilling bit of like size will follow to the bottom of the hole without reaming, but it also acts to steady and center the core drill, thereby contributing to obtaining higher percentages of core recovery. However, Reed hard-formation core drills can be run with or without the core-drill roller reamer. The lower connection which fits into the upper end of the core-drill reamer, when this is used, also fits directly into either hard-formation or soft-formation cutter heads when the roller reamer is not used.

Adds Three New Sizes of Super-Traction Truck Tires

Increased demand from truck owners has caused an expansion of the line of Super-Traction truck tires by the B. F. Goodrich Co., three new high pressure sizes having just been added. The three new sizes are 30 by 5, eight ply; 32 by 6, eight ply, and 32 by 6, heavy-duty ten ply. The first two take 75 lb. of air pressure, the latter 80 lb.

Since introduction of the Super-Traction type of truck tire, with a deeper tread of greater gripping power, designed mainly for off-pavement use, the popularity of this type tire for truck operations has consistently increased.

One-Man Aluminum Vulcanizer for Splicing Conveyor Belts

An aluminum one-man vulcanizer, for vulcanizing splices in transmission or conveyor belting up to 28 in. wide, is a recent development of The B. F. Goodrich Co., Akron, O.

Through the use of aluminum, cost of this unit has been greatly reduced and its weight lowered to under 300 lb., which

Electric equipment for vulcanizing splices in conveyor belting.

is said to be 75 per cent. lighter than similar vulcanizers of this size. Either of the two platens can be handled by one man or the entire vulcanizer lifted by two men.

The Goodrich No. 28 vulcanizer is said to equal the efficiency of any vulcanizer for transmission and conveyor belts up to 28 in. and offers the added advantage of being able to vulcanize narrow transmission belts up to 10 in., 6-ply inclusive in one heat. Unit is available in 110 or 220 volts a.c. and d.c., 110 and 220 v. a.c., 110 or 220 v. a.c.-d.c. The d.c. types may also be used for a.c. of equal voltage by changing the plug-in connections on the side of the vulcanizer. The vulcanizer comes equipped with curing pad and galvanized sheet covers. No clamping bars are necessary.

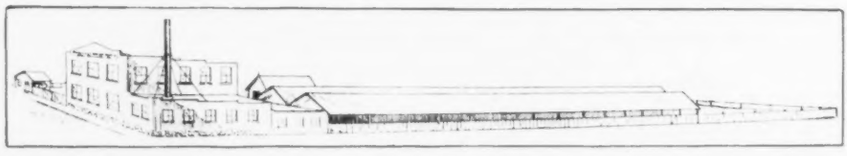
Offset Bail for Power-Shovel Dipper Eliminates Overhang

The Electric Steel Foundry Co., Portland, Ore., announces a new patent dogleg or offset bail for shovel dippers which is said to have eliminated the disadvantages of the ordinary bail. The ideal connection of the hoist block on a dipper is just as near as possible to the points of the teeth as this eliminates a long overhang and makes the hoist pull more effective.

The "Esco" offset bail is said to accomplish this to a marked degree without interfering with the load in the bucket as

Shovel dipper showing "dog-leg" bail.

Wire-Rope Firm Observes 60th Birthday



Celebrating its 60th anniversary this year, the Broderick & Bascom Rope Co., St. Louis, Mo., has released the above drawing of its first plant, built at St. Louis in 1876, and the photograph below which shows the present million-dollar plant of the company, erected in St. Louis in 1924. The present plan is devoted exclusively to the production of wire rope, a large percentage of which is Flex-Set, a preformed rope.

In the United States there are about 258,000 manufacturers. In theory, these firms could live forever. Actually, not one in a hundred lives 60 years. The average life of all manufacturing firms is seven years. Using this average as a basis of comparison, the 60-year-old Broderick & Bascom Rope Co. is old, very old.

But, business life is a strange anomaly. A firm has to stay young to grow old. Or, put it this way: No firm can attain a great age unless it retains its youth.

At 60, the Broderick & Bascom Rope Co. is lusty, vigorous, aggressive—youthful, if you please. Youth is at the helm. The actual average physical age of the executive heads, the engineers, the salesmen, and the operatives is many years younger than it was even ten years ago.

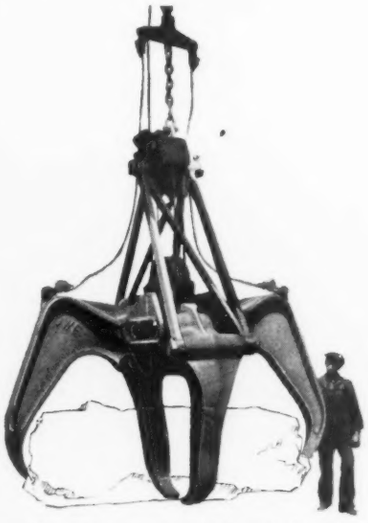
Wire rope, itself, is so vigorous, so active, strong, and resilient, that it sets its own creators a good example of virility. Wire rope making is a job for a youthful firm, and the more years of its youth, the better. Broderick & Bascom are 60 years young—and proud of it!

the lower arm of the bail never came above the upper edges of the dipper body. This type of bail also has the same advantages as other bails in saving the dipper body, teeth, dipper sticks and boom. The Electric Steel Foundry Co. manufactures a complete line of manganese-steel shovel dippers, dipper teeth, drag-line buckets, cableway excavators, chain, shackles and other equipment used in the nonmetallic-mineral industries.

Each Tine Acts Independently in New Model Stone Grapple

Of the many improved machines developed in recent years few have created more favorable comment than the new Owen Type RA grapple, manufactured by The Owen Bucket Co., Cleveland, O.

The most distinguishing feature of this new grapple, as compared with the 4-time grapple of conventional design, is the independent action of its tines. Instead of



New four-tine grapple which embodies several original features.

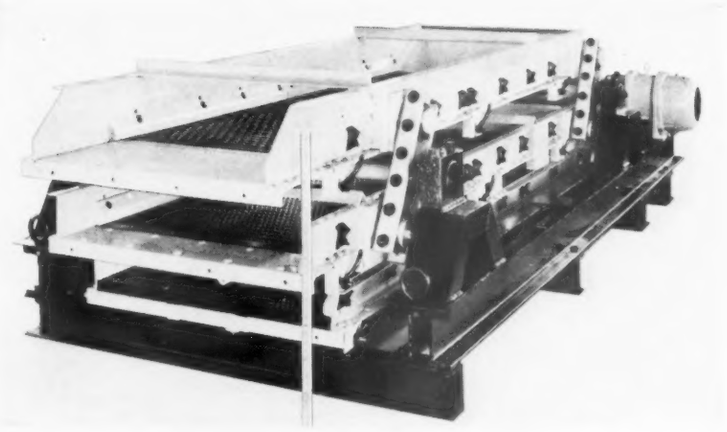
moving simultaneously toward the center in closing, any tine is capable of acting independently of the other three tines. This patented action, obtained by combining toggle-operated and arm-controlled tines, causes all four tines to grip any stone regardless of its shape, with practically equal pressure. This action enables the operator to place the grapple more easily and quickly and to handle greater quantities of stone with a factor of safety never before attained.

Upon seeing this grapple in operation recently one spectator likened its action to that of an octopus which completely entwines its victim in an inescapable hold.

This is the first formal announcement of this new grapple but units have been in operation in various sections of the country for several months. Grapples with capacities from 3 to 60 tons are illustrated and described in the new bulletin just off the press.

New Vibrating Screen Combines Whipping and Shaking Action

A new screen, operating on a level plane, that combines shaking and whipping in one operation has recently been announced by Hendrick Manufacturing Co., Carbondale, Pa. From this dual action it takes the name Hendrick flat shaking and whipping screen. The manufacturer claims for it an unusually rugged, perfectly balanced construction to withstand effectively the vibration encountered in service. At medium speed, with a short stroke, the new screen will operate between 350 and 400 r.p.m.



The action of this level-plane screen combines that of shaking and whipping.

The level-construction feature allows its installation on any flat foundation and will eliminate the expense entailed in the erection of special inclined supports. When location requires, it may even be suspended from overhead. Its low head room allows the use of locations with low ceilings. Special "hold-down" hooks make changing of the screen plates speedy and convenient.

To insure the long periods of service the eccentric is equipped with a heavy-duty, completely enclosed, spherical roller bearing. All other bearings are of hard phosphor bronze, grease lubricated to exclude dirt, dust and water.

The screen can be furnished in either two- or three-deck construction. It can be built 3, 3½, 4, or 5 ft. wide in any desired length up to 20 ft.

Shrinkage Greatly Reduced in Plastic Coating for Belts

The Self-Vulcanizing Rubber Co., Inc., 605 W. Washington Blvd., Chicago, Ill., announces an important development and refinement in its plastic rubber. The shrinkage of its cold, self-curing process has been reduced to about one-third that heretofore common in the application of rubber coatings and linings.

The shrinkage of SelfVulc Plastic will not now exceed 8½ per cent., it is claimed. The improved SelfVulc Plastic is thus more economical and more practical for rubber coating or lining work, and especially for rebuilding the surfaces of conveyor belts which have been worn down by the abrasion of the materials carried. The greatly decreased shrinkage means longer life for the rubber, and the practical elimination of all strains between the rubber coating or lining and the surface to which it is applied.

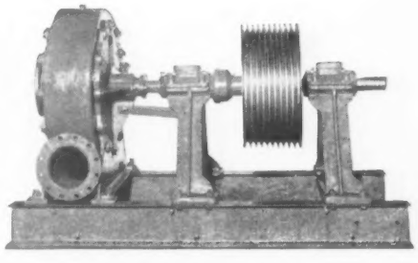
Pump Manufacturer Maintains Complete Testing Laboratory

The Pomona Pump Co., Pomona, Cal., is said to be the only manufacturer of deep-well turbine pumps that maintains a fully equipped research department, including a concrete well 135 ft. deep and 4½ ft. in diameter, in a separate building exclusively devoted to the study of possible improvements and rigorous tests of the finished products. The control of this department rests in the management, and its findings are under the constant observation of the engineering department. Research in the chemical and physical laboratories insures the maintenance of high and uniform standards in all materials used. Post-search after production gives accurate data on every pump before it leaves the plant.

Every Pomona pump has to give a satisfactory statistical account of itself before it is shipped. It is first driven at variable speeds by a motor-generator type of a.-c. frequency changer, at speeds varying from 500 to 3500 r.p.m., at 220 or 440 v. Records are taken on integrating and automatic reading tachometers. Mounted on a specially built vertical torsional dynamometer, brake horsepower input to the pump is measured. Records of driving torque are made on a springless precision scale in foot-pounds. Proper constants and leverages are used so that small horsepower readings are as highly accurate as large ones, and may be recorded to 0.01 horsepower.

Various means are employed for taking pressure head measurements, but none has been found more accurate and consistently unvarying than the mercury column. All head measurements are taken direct, both above and below a permanent bench mark or datum line. Heads can be measured up to 320 ft. with an accuracy of 0.01 ft.

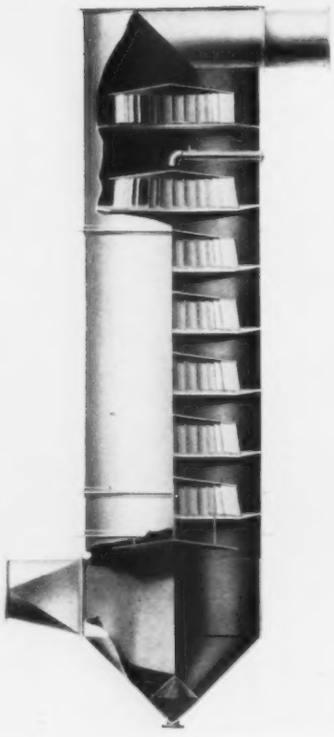
The Pomona Pump Co. has just issued a new illustrated bulletin showing in detail the various activities of its research and testing department. Copies may be obtained without charge by addressing the company at Pomona, Cal., or 53 W. Jackson Blvd., Chicago, Ill.



Type of 10-in. centrifugal pump sold recently by the Kansas City Hay Press Co. to Morrison, Glascock & Connor at Blair, Neb. It is to be used to pump out sand bars in the Missouri River and will be driven by a twin 250-hp. marine engine. Note the large multiple V-belt drive.

The Goodyear Tire & Rubber Co. has just completed production of its first 250,000,000 tires and is now at work on its second quarter-billion casings, according to an announcement from Goodyear headquarters at Akron, O. In building so many tires the company estimates it has consumed 2,400,000 bales of cotton and 1,375,000 tons of crude rubber.

Pointing out that its founder, Erskine Hazard was the first successful user of anthracite coal, the exhibit of the Hazard Wire Rope Co. attracted considerable attention at the recent exposition of the Mining Congress at Cincinnati, O.



Left—Cut-away view of the improved wet-type dust collector.

Announces New Series of Dust-Collecting Towers

The Claude B. Schneible Co., 3951 Lawrence Ave., Chicago, announces a new line of wet dust collectors.

These improved wet collector towers, similar in external appearance to those previously offered, are now made with six dust impingement plates; the seventh of the series being designed for use as a water entrainment separator to gather the remaining moisture from the clean air before it is exhausted

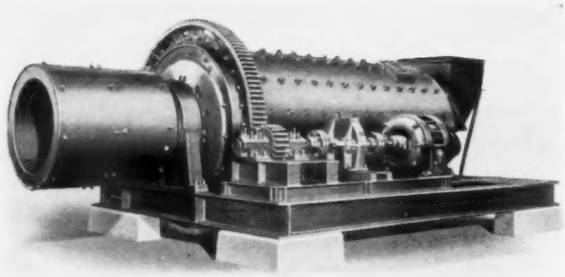
Other major design changes include a dirty-air baffle under the first impingement plate, wearing-strip reinforcing, an air-directional baffle on the inlet side in the cyclone chamber, and a screened strainer on the sludge discharge line.

This improved design has been made to better cope with dust-hazard conditions in industrial plants having dust or fume conditions that are injurious to workers' health and because it employs the wet method of dust suppression it is claimed to solve this problem in a most simple way.

The Schneible company have recently issued a bulletin on the subject of dust suppression which is available from its Chicago office.

Designs Blade-Mill As Improvement Over Log Washer

Allis-Chalmers Mfg. Co. of Milwaukee, Wis., announces a new piece of machinery designated as a blade mill. It is a special development for washing, disintegrating, and cleaning ores, stone and other products containing a large amount of clay, slime, or other materials that are detrimental to subsequent processes of treatment. The inner periphery of the mill is provided with a series of removable log-washer-type teeth arranged for angular adjustment on special bases to which the teeth are attached. The disintegration is effected by combined cutting and rolling action in water within the mill. It is said to have a much wider application than the conventional log washer, as it can handle material up to 12 in. or larger in size.



Right—The new blade-mill used for scrubbing extremely dirty materials.

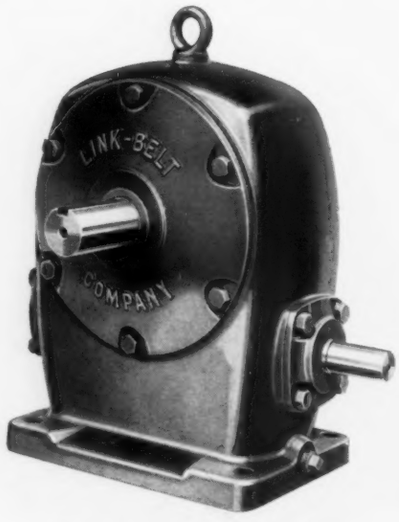
The mill is arranged for variable speed and variable pulp level. The combination of angular adjustment of blades, with variable depth of pulp and speed, provides unusual flexibility. It has a wide range of adaptability both for the treatment of ores and in the aggregates industry.

Cut-Tooth Worm Gearing in New Line of Speed Reducers

Announcement is made by Link-Belt Co., Philadelphia, that it has developed and is now in production on a new line of cut-tooth worm gear speed reducers of simple, compact, accessible construction, offering great flexibility of driving arrangement.

The new reducers are available in a wide range of ratios and capacities, with single or double reduction, and in horizontal and vertical types; all provided with precision tapered roller bearings and automatic lubrication within dust-proof gray iron housings.

The output shaft with its chilled phosphor-bronze worm-wheel can be located



Compact, worm-gear speed reducer.

above or below the worm shaft, which is made of a low-carbon alloy-steel forging, carburized and heat-treated after the worm threads have been cut thereon. A feature of the double-reduction reducer is the unitized attachment of primary reduction unit to the side of final-reduction housing.

Conforming with the recently recommended practice of the American Gear Manufacturers Assn., the name plate of each Link-Belt worm reducer is stamped to indicate the ratio, input and output r.p.m., the input horse power or output torque capacity, and the service factor used in determining the rating for which the unit has been sold.

Dual-Ratio Drive Increases Carrying Capacity of Trucks

The Thornton Tandem Co., 5166 Braden St., Detroit, Mich., is marketing a unit for increasing the load capacity of 1½-ton trucks. It is known as the Thornton dual-ratio four-wheel drive.

The unit comprises two parallel driving axles between which is placed a gear-box

A 1½-ton truck equipped with the dual-ratio four-wheel drive being loaded in pit with 8 tons of sand. The driveway is on a 12 to 15 per cent. grade.

providing 8 forward speeds and 2 reverse speeds. The forward of these axles follows the lead of the truck's front wheels, allowing the truck to turn from a flush curb contact and to turn and back as any ordinary two-wheel-drive truck. The frame is supported over the axles by a double spring suspension which provides a low center of

This 1½-ton truck, equipped with the four-wheel drive, carries a 3-cu.yd. concrete mixer.

gravity and good balance. Braking is provided on all four rear wheels. It is claimed that the substitution of a Thornton unit for the regular rear-end assembly of a 1½-ton truck will make either of them capable of handling 26,000 lb. gross when operated as a 6-wheeled truck and 44,000 lb. when used to haul a semi-trailer. The Thornton Tandem is applicable, as the illustrations show, to both intraplant haulage and higher-speed delivery.

Ball-Mill Has Boltless Liners and Positive Grated Discharge

A new ball-mill with boltless liners and positive grated discharge is being marketed by the American Ball Mill Co., Denver, Colo. Grated or diaphragm-type ball mills have been accepted as fundamentally sound for many years but heretofore mills of this type have lacked a "positive" discharge, merely permitting the escape of a portion of the finished product. The new Abco mill utilizes the grate principle, picking up the finished product at the periphery

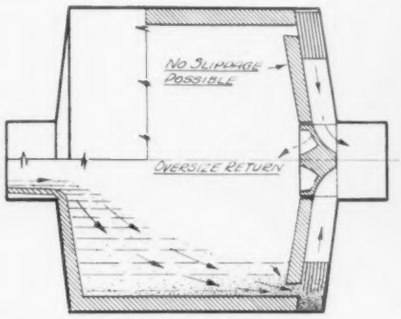


Diagram of ball-mill showing operating principle of both liners and discharge.

of the mill and discharging it by gravitational force through the trunnion. Slippage is thus eliminated and slimes which always resulted in the old-type mill are reduced to the vanishing point.

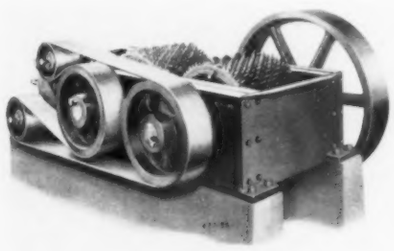
In the Abco, the grates are never exposed to the action of the balls, eliminating wear from that source. The finished product is allowed a free and unobstructed flow directly out of the mill, the oversize returning simultaneously to the grinding chamber.

The lining being boltless, there are no bolt-holes in the shell for leakage to occur. Spherical SKF self-aligning bearings are used throughout.

Full information, including complete engineering data production charts and curves, is contained in a new bulletin recently published by the company which will be sent upon request.

Self-Contained Endless Belt Allows Adjustment on Crusher

The Jeffrey Manufacturing Co. of Columbus, O., has developed a new design of double roll-crusher. The chief feature of this machine is a self-contained endless-



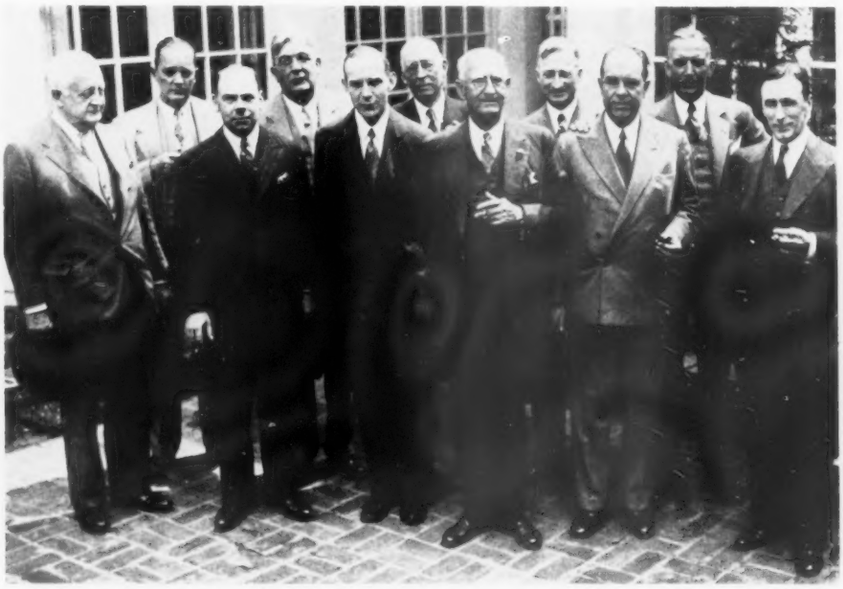
Double roll-crusher with endless belt drive.

belt drive between the rolls which allows quick adjustment of the rolls within the limits of the sizing range while the machine is running. The crusher is also provided with an all-steel frame having heavy steel cross-ties.

Department of Commerce Issues Construction-Industry Booklet

A 123-page booklet which presents the broad economic facts relating to the construction industry and the activities of its allied groups has just been issued by the U. S. Department of Commerce. A list of nearly 600 trade associations is included. Copies costing 10c. each may be obtained from the Bureau of Foreign and Domestic Commerce at Washington, D. C. or at the Bureau's district offices located in the larger cities.

British Cement Makers Visit U. S.



Leading British cement manufacturers shown as they stopped in Detroit to inspect Wayne County concrete highways. Left to right: H. H. D. Anderson, director, Associated Portland Cement Co., Ltd.; N. C. Dibben, Erwin Wasey & Co., London; H. W. L. Reddish, F. C. A., managing director, Rugby Portland Cement Co., Ltd.; L. R. Smith, chief engineer, Wayne County Highway Commission; Viscount Wolmer, M. P., chairman, Cement Makers' Federation; Chas. Weeks, Detroit; Ed Hines, Wayne County road commissioner; E. J. Mehren, president, Portland Cement Assn.; A. Y. Gowen, managing director, Alpha Cement, Ltd.; Col. S. D. Waldon, Detroit; Maj. R. A. B. Smith, director, Cement and Concrete Assn.

New Cupola Being Installed at Rock-Wool Plant in Indiana

A new cupola is being installed in the Lagro, Ind., plant of the National Rock Wool Co. More than 60 men are employed and production is said to be at the highest level in the plant's history.

Personnel Changes Announced by Morris Machine Works

Morris Machine Works of Baldwinsville, N. Y., announces that changes in its executive personnel, incident to the death of Windsor Morris, have resulted in the election of Carl Lager as president, and Pierce J. McAuliffe, as vice-president and general manager.

Mr. Lager, the new president, joined the organization as its chief engineer 46 years ago, and during this period he has been a leading factor in the remarkable advance in the development and application of centrifugal pumps.

The village of Baldwinsville, where the plant is located, can be called the cradle of centrifugal pumps. It was there that the first centrifugal pump was made, and the original patents on the open and on the enclosed impeller were granted to its residents. Morris Machine Works is the outgrowth of these initial centrifugal pump developments.

Mr. McAuliffe joined the company in 1910 as designer of hydraulic dredging equipment. During the War, he was with the Construction Division of the Emergency Fleet Corp., becoming manager of ship construction in 1918. He rejoined Morris Machine Works in 1920, and continued as their representative in the New York office until taking up his new duties at Baldwinsville.

Personals

A. T. Brown, formerly general auditor and assistant secretary of the Caterpillar Tractor Co., has been elected a vice-president, and **D. G. Sherwin,** vice-president, has also been named treasurer, succeeding **Henry M. Hale,** who has been appointed manager of the eastern sales division.

M. W. Smith has been appointed manager of engineering of the Westinghouse Electric & Manufacturing Co.

Mr. Smith has been associated with Westinghouse since 1915, first as design engineer, and more recently in charge of the design of the large rotating alternating current machinery of the generator division.

H. E. Mensch has been appointed district sales agent for the Michigan territory, with office in the Book Bldg., Detroit, for the Ohio Locomotive Crane Co., Bucyrus, O.

Ferdinand W. Roebling, Jr., president of John A. Roebling's Sons Co., Trenton, N. J., died in New York, N. Y., on May 29. He was 57 years old. Mr. Roebling was widely known as a designer of large suspension bridges and designed machinery for wire drawing which is still in use.

F. G. Conkling, sales manager of the Signal Mountain Portland Cement Co., Chattanooga, Tenn., died recently. He was 55 years old.

Incorporations

HURON RIVER SILICA CO., Detroit, Mich. Incorporated to mine and process sand. Capital stock $600,000 of which $197,000 has been paid in.

TRI-STATE GRAVEL CO., Lexington, Miss. Incorporated by C. T. Cully of Greenville, Miss., and W. A. Delaney of Columbia, Miss. The company has leased 400 acres of deposits near Lexington, Miss.

QUALITY EARTH, INC., Epley Bluff, Ala. Incorporated by M. J. Epley to develop a deposit of fullers' earth in Clarke County, Alabama.

ROSE CITY SAND & GRAVEL CO., Portland, Ore. Incorporated by Earl F. and John Simpson.

YAKIMA SAND & GRAVEL CO., Yakima, Wash. Capital $25,000. Incorporated by Leo S. Rose, Irvine Longbottom and Grover Burrows.

Introduces Second in Series of Diesel-Powered Excavators

Second in the new 700 series of Diesel-powered excavators, announced this year by the Harnischfeger Corp., Milwaukee, Wis., is the Model 705, a full-revolving machine of 1½-cu.yd. capacity for which the builders claim increased operating speeds at a lower cost per yard.

Completely redesigned to take advantage of the newest developments in high-tensile alloy steels and the use of arc welding, considerable emphasis has been laid upon weight reduction to obtain a higher ratio of horsepower per pound of weight, thus reducing the effect of inertia for faster operating speeds with lower fuel consumption.

Standard power on this new 1½-cu-yd. machine is a 6-cyl. Caterpillar Diesel engine rated at 130 horsepower at 900 r.p.m., although gasoline power is also available. The model 705 is fully convertible for service as shovel, dragline, crane, trench hoe, skimmer or pile driver.

Trade Literature

LeTourneau Carryall Scrapers. 16 p. (R. G. LeTourneau, Inc., Peoria, Ill.)

The Roll Crusher—Its Place in the Crushing Industry. 8 p. (Pioneer Gravel Equipment Mfg. Co., Minneapolis, Minn.)

Rex Moto-Mixers and Agitators. 44 p. (Chain Belt Co., Milwaukee, Wis.)

An Index to Bristol's Industrial Instruments. 8 p. (The Bristol Co., Waterbury, Conn.)

The New Remote Control Speedcrane. 4 p. (Manitowoc Engineering Works, Manitowoc, Wis.)

Worthington Diesel Engines. 8 p. (Worthington Pump & Machinery Corp., Harrison, N. J.)

Magnetic Pulleys and Separators. 34 p. (Dings Magnetic Separator Co., Milwaukee, Wis.)

Instruments from the Executive Viewpoint. 24 p. (Brown Instrument Co., Philadelphia, Pa.)

Bay City Convertible Shovels-Draglines-Cranes. 32 p. (Catalog G. Bay City Shovels, Inc., Bay City, Mich.)

Maintenance of Calcium-Chloride Stabilized Roads. 16 p. Calcium Chloride Assn., Detroit, Mich.

Skip Hoist and Dragline Machinery. 64 p. (Palmer-Bee Co., Detroit, Mich.)

The Babcock & Wilcox Integral-Furnace Boiler. 24 p. (The Babcock & Wilcox Co., New York, N. Y.)

Handbook of Worm Gearing and Worm-Gear Speed Reducers. 86 p. (Foote Bros. Gear & Machine Co., Chicago, Ill.)

Cedar Rapids Roller Bearing Crushers. 4 p. (Iowa Manufacturing Co., Cedar Rapids, Ia.)

Thor Mining and Contractors' Tools. 12 p. (Independent Pneumatic Tool Co., Chicago, Ill.)

Dust Collectors and Arrestors. 8 p. (The MacLæod Co., Cincinnati, O.)

Ro-Twin Air Compressors. 8 p. (Allis-Chalmers Mfg. Co., Milwaukee, Wis.)

Kimball-Krogh Sand and Tailings Pumps. 4 p. (Victor Equipment Co., Los Angeles, Cal.)

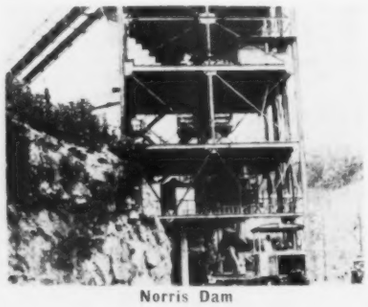
Keystone Specialized Lubricants—Application Guide. 20 p. (Keystone Lubricating Co., Philadelphia, Pa.)

Type H Blake Jaw Crusher. 12 p. (Traylor Engineering & Mfg. Co., Allentown, Pa.)

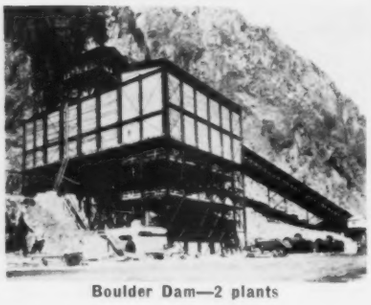
Champion Crushers. 8 p. (Good Roads Machinery Corp., Kennett Square, Pa.)

Condor Asbestos Friction Material for Industry. 12 p. (Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., Passaic, N. J.)

The Owen Bucket Co. has opened a warehouse and branch office at S. 56th St. and Grays Ave., Philadelphia, Pa., in charge of George A. Whitehead. A full line of clam-shell buckets and parts is being carried, and a complete rental and repair service is to be maintained.


Norris Dam

Bonneville Dam


Boulder Dam—2 plants

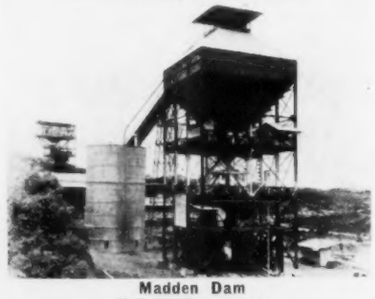
Some of the Batching Plants equipped by

THE C. S. JOHNSON COMPANY

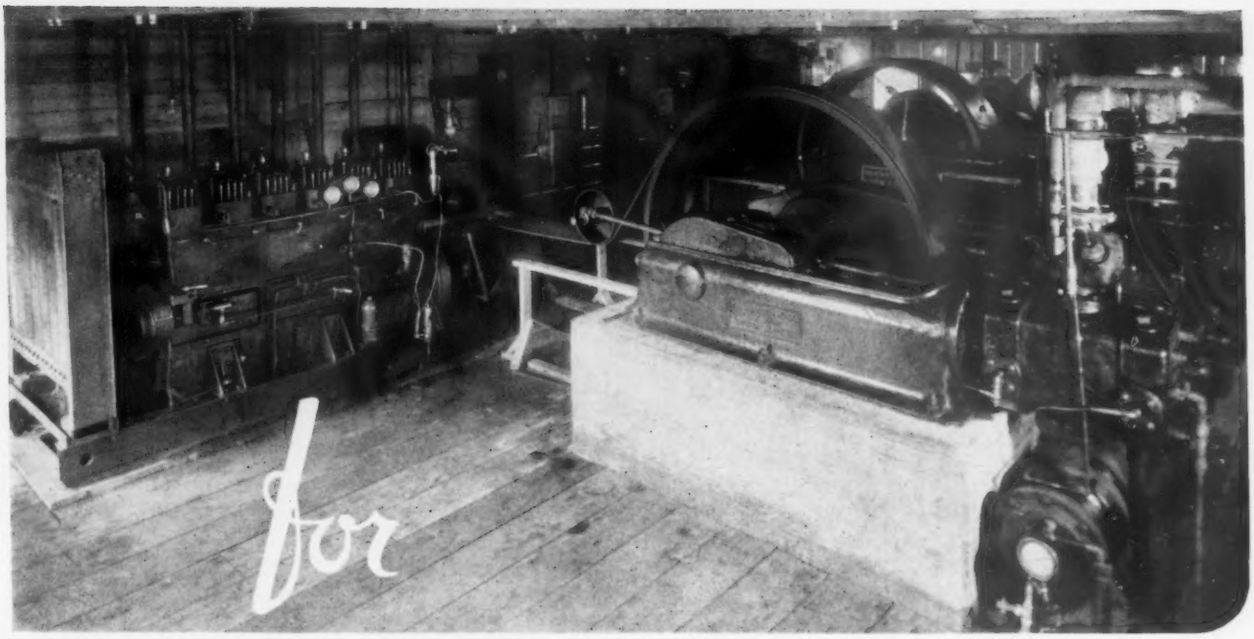
Champaign, Illinois

Pickwick Dam

Grand Coulee Dam—2 plants


Madden Dam

Dover Dam



TOUGH JOBS
Contractors buy
ATLAS DIESELS!

When contractors are up against a construction job that is really tough—where the profit or loss on the project may be determined by the ability of their equipment to withstand a beating—that is when they turn with confidence to ATLAS DIESELS.

Among the tough jobs of the century is the construction of Bonneville Dam on the Columbia River. Here again ATLAS DIESELS have come through with flying colors. Pictured here are two of the Diesel applications employed by the Guy F. Atkinson Company, in the construction of Bonneville Dam.

The picture above shows an ATLAS DIESEL power unit driving an air compressor which furnished the air for the rock drills. They had to have a dependable air supply—failure meant cessation of blasting and a complete and expensive shutdown. The drill runners worked day and night—the ATLAS DIESEL had to operate continuously to keep the drills humming. It did the job well.

At the right is a Bucyrus shovel, powered by an ATLAS DIESEL and working on the toughest shovel job on the entire project. It was chosen for this job because it never broke down and had plenty of reserve power. Note in the picture that it is handling boulders far too large to go through the dipper. They are picked up and placed on trucks by dumping them over the teeth.

When you want a Diesel for an industrial, stationary or marine application, buy an engine that can "take it"—buy an ATLAS DIESEL.

ATLAS IMPERIAL DIESEL ENGINE COMPANY

OAKLAND, CALIFORNIA ◆ MATTOON, ILLINOIS

ATLAS IMPERIAL

Classified Buyers' Guide

A Directory of PIT AND QUARRY Advertisers Arranged According to Product

Although every effort is made to insure accuracy and completeness in these listings, the publisher cannot accept responsibility for errors or omissions. Any mistakes discovered will gladly be rectified, if brought to the attention of the Advertisers' Service Department.

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Hetherington & Berner, Inc.

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*Blaw-Knox Co.
Johnson Co., C. S.

Agitating Ladders (Dredge)
*Eagle Iron Works

Agitators, Thickness and Slurry Mixers
*Hardinge Co.
*Traylor Engr. & Mfg. Co.

Air Compressors (Portable)
*Fuller Co.
Gardner-Denver Co.
Tractor & Equipment Co.
*Traylor Engr. & Mfg. Co.
Worthington Pump & Machy. Corp.

Air Compressors (Stationary)
*Fuller Co.
Gardner-Denver Co.
Tractor & Equipment Co.
*Traylor Engr. & Mfg. Co.
Worthington Pump & Machy. Corp.

Air Filters
*Blaw-Knox Co.
*Fuller Co.
*Western Precipitation Co.

Air Pumps
*Fuller Co.
Gardner-Denver Co.
Worthington Pump & Machy. Corp.

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*Raymond Bros. Impact Pulv. Co.
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Manganese Steel Forge Co.
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*Bartlett & Snow Co., C. O.
Haiss Mfg. Co., Geo.
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*Jeffrey Mfg. Co.
*Link Belt Co.
*Robins Conveying Belt Co.

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*Bartlett & Snow Co., C. O.
*Fuller Co.
*Hardinge Co.
*Jeffrey Mfg. Co.
*Link Belt Co.

Automatic Weighers
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Manganese Steel Forge Co.

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*Robins Conveying Belt Co.

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Haiss Mfg. Co., Geo.
Hewitt Rubber Corp.
*Link-Belt Co.
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*Robins Conveying Belt Co.
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Goodyear Tire & Rubber Co.
Republic Rubber Co.

Belts (Fan)
Goodyear Tire & Rubber Co.
Republic Rubber Co.

Bin Gates
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Blast-Hole Drills (See Drills—Blast-Hole)

Blasting Machines
Du Pont de Nemours & Co.

Blasting Supplies
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Blocks (Sheave)
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*Blaw-Knox Co.
Jaeger Machine Co.

Boots (Rubber)
Goodyear Tire & Rubber Co.

Borings, Core
Hoffman Bros. Drilling Co.
Pennsylvania Drilling Co.

Bronze Work (Ornamental)
*Tyler Co., W. S.

Bucket Elevators (See Conveyors and Elevators)

Buckets (Clamshell, Orange-Peel, Etc.)
*Bartlett & Snow Co., C. O.
*Blaw-Knox Co.
Haiss Mfg. Co., Geo.
*Harnischfeger Corp.
Industrial Brownhoist Corp.
Kiesler Co., Jos. F.
*Link-Belt Co.
Owen Bucket Co.
Tractor & Equipment Co.
Wellman Engr. Co.

Buckets (Dragline—Cableway)
American Manganese Steel Co.
*Bartlett & Snow Co., C. O.
*Link-Belt Co.
*Page Engr. Co.
*Pioneer Gravel Equipment Mfg. Co.
*Sauerman Bros., Inc.
Wellman Engr. Co.

Buckets (Elevator and Conveyor)
*Bartlett & Snow Co., C. O.
Haiss Mfg. Co., Geo.
*Hendrick Mfg. Co.
Industrial Brownhoist Corp.
*Jeffrey Mfg. Co.
*Link-Belt Co.
Manganese Steel Forge Co.
McLanahan and Stone Corp.
*Pioneer Gravel Equipment Mfg. Co.
*Robins Conveying Belt Co.
Smith Engr. Works

Buggies (Dump)
*Koehring Co.

Cableways
*Link-Belt Co.
*Page Engr. Co.
*Roebling's Sons Co., John A.
*Sauerman Bros., Inc.
Tractor & Equipment Co.

Calcium Chloride
Calcium Chloride Assn.

Caps (Blasting)
Du Pont de Nemours & Co.

Capstans (See Winches and Capstans)

Car Dumpers
Industrial Brownhoist Corp.
*Link-Belt Co.
Wellman Engr. Co.

Car Pullers
*Bartlett & Snow Co., C. O.
*Jeffrey Mfg. Co.
*Link-Belt Co.

Carriers
*Bartlett & Snow Co., C. O.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.
Smith Engr. Works

Cars (Quarry and Gravel Pit)
*Austin-Western Road Machy. Co.

Car Wheels — (See Wheels — Car)

Carryalls
*Koehring Co.

Castings
American Manganese Steel Co.
*Bartlett & Snow Co., C. O.
*Eagle Iron Works
*Hardinge Co.
Hetherington & Berner, Inc.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Link-Belt Co.
McLanahan and Stone Corp.
*Robins Conveying Belt Co.

Cement Pumps (See Pumps; Air Pumps; Pumps, Cement Slurry; Pumps, Bulk Cement)

Central Concrete Mixing Plants (Complete)
*Bartlett & Snow Co., C. O.

Chain (Dredge and Shovel)
Manganese Steel Forge Co.
Ryerson & Son, Joseph T.

Chain Drives
*Link-Belt Co.

Chain (Elevating and Conveying)
American Manganese Steel Co.
*Bartlett & Snow Co., C. O.
Haiss Mfg. Co., Geo.
Industrial Brownhoist Corp.
*Jeffrey Mfg. Co.
*Link-Belt Co.
Manganese Steel Forge Co.

Chute Lining (Rubber)
Goodyear Tire & Rubber Co.

Chutes and Chute Liners
American Manganese Steel Co.
*Bartlett & Snow Co., C. O.
Haiss Mfg. Co., Geo.
*Hendrick Mfg. Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
McLanahan and Stone Corp.
*Robins Conveying Belt Co.

Classifiers
*Deister Machine Co.
*Hardinge Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machine Co.
*Link-Belt Co.
Simplicity Engr. Co.

Clips (Wire Rope)
*Roebling's Sons Co., John A.

Clutches
*Jeffrey Mfg. Co.
*Link-Belt Co.

Coal-Pulverizing Equipment
*Allis-Chalmers Mfg. Co.
*Bartlett & Snow Co., C. O.
Bonnot Co.
*Hardinge Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Raymond Bros. Impact Pulv. Co.
*Williams Pat. Crusher & Pulv. Co.

Compressors (See Air Compressors)

Concentrators (Slurry)
*Deister Concentrator Co.

Concrete Breakers
Gardner-Denver Co.
Worthington Pump & Machy. Corp.

Concrete Mixers
Jaeger Machine Co.
*Koehring Co.

Concrete Slab-Raising Equipment (Mud-Jacks)
*Koehring Co.

Cones (Sand-Washing)
*Bartlett & Snow Co., C. O.
*Link-Belt Co.
Smith Engr. Works

Conveyor Belting (See Belting)

Conveyor Idlers and Rolls
*Bartlett & Snow Co., C. O.
Haiss Mfg. Co., Geo.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

Conveyors and Elevators
*Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
Bacon, Inc., Earle C.
*Bartlett & Snow Co., C. O.
*Fuller Co.
*Gruendler Crusher & Pulverizer Co.
Haiss Mfg. Co., Geo.
*Hendrick Mfg. Co.
Industrial Brownhoist Corp.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machinery Co.
*Link-Belt Co.
McLanahan and Stone Corp.
New Holland Machine Co.
*Pioneer Gravel Equipment Mfg. Co.
*Robins Conveying Belt Co.
Smith Engr. Works
Tractor & Equipment Co.
*Traylor Engr. & Mfg. Co.

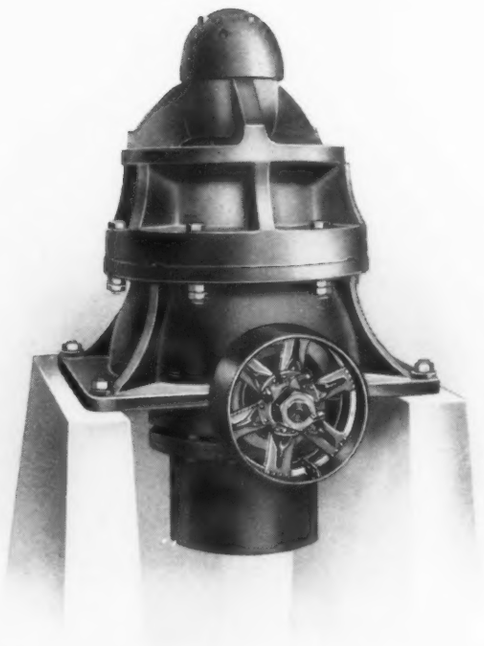
Conveyors (Pneumatic)
*Fuller Co.

Conveyors (Ready-Mixed Concrete)
*Bartlett & Snow Co., C. O.
*Blaw-Knox Co.
Haiss Mfg. Co., Geo.
Jaeger Machine Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

Coolers (Clinker)
*Allis-Chalmers Mfg. Co.

*** See also information in the 1936 Pit and Quarry HANDBOOK.**

TRAYLOR



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A customer says that it ". . . produces a much greater percentage of ruling size material with far less oversize than . . ."

Four sizes—10 tons to ¼" to 225 tons to 2".

Send for our new Bulletin No. 112.

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Allentown, Pa.

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CHICAGO
2151 One La Salle St. Bldg.

SALT LAKE CITY
101 West Second South St.

LOS ANGELES
919 Chester William Bldg.

SEATTLE
6311 22nd Ave., N. E.

Timmins, Ontario, Canada
P. O. Box 113

MANILA MACH. & SUPPLY CO.
Manila and Baguio, P. I.

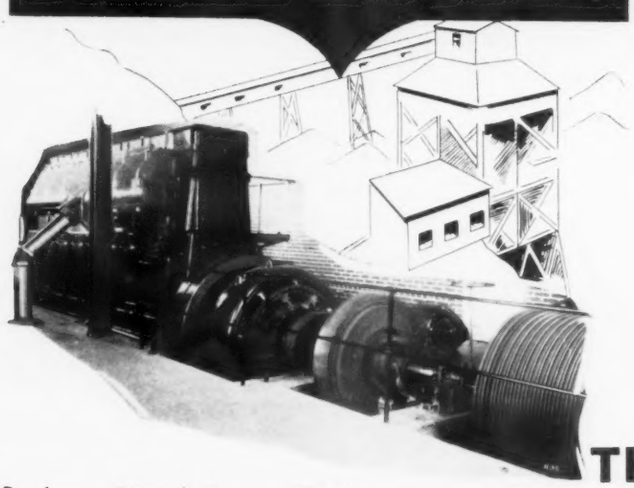
Robins Conveyors (So. Africa) Inc.
Johannesburg, Transvaal, S. A.

Export Department—104 Pearl St., New York City.

Foreign Sales Agencies: London, Lima, Sao Paulo, Rio de Janeiro, Buenos Aires, Santiago, Valparaiso, Antofagasta, Iquique, Oruro

European Works—Usines Carels Freres, Ghent, Belgium.

You Can Reduce High Power Costs with a BUCKEYE DIESEL ENGINE



Buckeye Diesel Power Plants soon pay for themselves—Then pay big dividends.

Buckeye Diesels have established remarkable records of economy and reliability in all types of plants. The operating figures show reductions in power costs as high as 70% of former steam and electric costs.

Such savings are expected from Buckeyes because they burn cheap fuel oil, are easy to operate and are built to give hard service at low cost for years and years.

In addition, you get all advantages of the ordinary Diesel with a Buckeye plus a combination of seven outstanding and proven principles of design and construction which makes a better built engine resulting in longer life and lower power cost. Let us give you figures on Buckeye Diesels to suit your needs. No cost. Write today.

THE BUCKEYE MACHINE CO.
LIMA, OHIO

ENGINE BUILDERS SINCE 1908

BE PROFITWISE AND DIESELIZE with Buckeye

Classified Buyers' Guide

A Directory of PIT AND QUARRY Advertisers Arranged According to Product

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Coolers (See Kilns and Coolers—Rotary)

Couplings (Flexible and Shaft)
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

Cranes (Crawler and Locomotive)
*Austin-Western Road Machy. Co.
Industrial Brownhoist Corp.
*Koehring Co.
*Lima Locomotive Works, Inc.
*Link-Belt Co.
Michigan Power Shovel Co.
Northwest Engr. Co.
Tractor & Equipment Co.

Cranes (Overhead)
Industrial Brownhoist Corp.

Crusher Parts
American Manganese Steel Co.
*Bartlett & Snow Co., C. O.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
McLanahan and Stone Corp.

Crushers (Cone)
Nordberg Mfg. Co.

Crushers (Hammer)
*Allis-Chalmers Mfg. Co.
*Austin-Western Road Machy. Co.
*Bartlett & Snow Co., C. O.
Bonnot Co.
Carnegie-Illinois Steel Corp.
*Dixie Machy. Mfg. Co.
*Gruendler Crusher & Pulverizer Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng Corp
*Williams Pat. Crusher & Pulv. Co.

Crushers (Jaw and Gyratory)
*Allis-Chalmers Mfg. Co.
*Austin-Western Road Machy. Co.
Bacon, Inc., Earle C.
*Bartlett & Snow Co., C. O.
*Gruendler Crusher & Pulverizer Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machinery Co.
New Holland Machine Co.
Nordberg Mfg. Co.
*Pioneer Gravel Equipment Mfg. Co.
Smith Engr. Works
Tractor & Equipment Co.
*Traylor Engr. & Mfg. Co.

Crushers (Ring)
*Bartlett & Snow Co., C. O.
*Williams Pat. Crusher & Pulv. Co.

Crushers (Roll)
*Allis-Chalmers Mfg. Co.
*Austin-Western Road Machy. Co.
*Bartlett & Snow Co., C. O.
Bonnot Co.
*Gruendler Crusher & Pulverizer Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Link-Belt Co.
McLanahan and Stone Corp.
New Holland Machine Co.
*Pioneer Gravel Equipment Mfg. Co.
*Robins Conveying Belt Co.
*Williams Pat. Crusher & Pulv. Co.

Crushers (Rotary)
*Allis-Chalmers Mfg. Co.
*Austin-Western Road Machy. Co.
*Bartlett & Snow Co., C. O.
Bonnot Co.
New Holland Machine Co.
*Williams Pat. Crusher & Pulv. Co.

Crushing Rolls
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
*Austin-Western Road Machy. Co.
Bonnot Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Link-Belt Co.
McLanahan and Stone Corp.
New Holland Machine Co.
*Traylor Engr. & Mfg. Co.
*Williams Pat. Crusher & Pulv. Co.

Detonators
Du Pont de Nemours & Co.

Diesel Engines (See Engines—Diesel)

Dipper Parts
American Manganese Steel Co.

Dippers and Teeth (Power Shovel)
American Manganese Steel Co.
*Koehring Co.

Dragline Cableway Excavators
*Link-Belt Co.
*Page Engr. Co.
*Sauerman Bros., Inc.
Tractor & Equipment Co.

Dragline Excavators
*Austin-Western Road Machy. Co.
Industrial Brownhoist Corp.
*Koehring Co.
*Lima Locomotive Works, Inc.
*Link-Belt Co.
Michgan Power Shovel Co.
Northwest Engr. Co.
*Page Engr. Co.

Dredges
Hetherington & Berner, Inc.
*Morris Machine Works

Drilling Accessories
Gardner-Denver Co.
Worthington Pump & Machy. Corp.

Drilling Contractors
Hoffman Bros. Drilling Co.
Pennsylvania Drilling Co.

Drills (Blast-Hole)
Gardner-Denver Co.
Tractor & Equipment Co.
Worthington Pump & Machy. Corp.

Drills (Core)
Hoffman Bros. Drilling Co.
Pennsylvania Drilling Co.

Drills (Diamond)
Hoffman Bros. Drilling Co.
Pennsylvania Drilling Co.

Drills (Hand-Hammer)
Gardner-Denver Co.
Worthington Pump & Machy. Corp.

Drills (Rock)
Gardner-Denver Co.
*Jeffrey Mfg. Co.
Tractor & Equipment Co.
Worthington Pump & Machy. Corp.

Drill Sharpening Machinery
Gardner-Denver Co.

Drills (Well) (See Drills—Blast-Hole)

Drives (Multiple, Belt, Chain, Rope)
*Allis-Chalmers Mfg. Co.
Worthington Pump & Machy. Corp.

Dryers
*Allis-Chalmers Mfg. Co.
*Bartlett & Snow Co., C. O.
Bonnot Co.
*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Fdry. & Mch. Co.
McLanahan and Stone Corp.
*Traylor Engr. & Mfg. Co.
*Tyler Co., W. S.

Dust Arresters
*Bartlett & Snow Co., C. O.
*Blaw-Knox Co.
*Western Precipitation Co.

Dust Collecting Systems
*Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
*Bartlett & Snow Co., C. O.
*Blaw-Knox Co.
*Raymond Bros. Impact Pulv. Co.
*Western Precipitation Co.

Dust Conveying Systems
*Allen-Sherman-Hoff Co.
*Bartlett & Snow Co., C. O.
*Blaw-Knox Co.
*Fuller Co.
*Western Precipitation Co.

Dust Handling Systems (Hydro Vacuum)
*Allen-Sherman-Hoff Co.

Dynamite (See Explosives)

Electrical Equipment
*Allis-Chalmers Mfg. Co.

Electrodes (Welding)
Stulz-Sickles Co.

Elevator Belting (See Belting)

Elevators (See Conveyors and Elevators)

Eliminators (Soft Stone) (See Soft Stone Eliminators)

Engineers
*Allis-Chalmers Mfg. Co.
Bacon, Inc., Earle C.
*Bartlett & Snow Co., C. O.
Bonnot Co.
*Fuller Co.
Hetherington & Berner, Inc.
*Kennedy-Van Saun Mfg. and Eng. Corp.
McLanahan and Stone Corp.
*Robins Conveying Belt Co.
Wellman Engr. Co.

Engine Generator Sets
See Generator Sets (Engine).

Engines (Diesel)
Atlas Imperial Diesel Engine Co.
Buckeye Machine Co.
*Cooper-Bessemer Corp.
Cummins Engine Co.
International Harvester Co.
Nordberg Mfg. Co.
*Page Engr. Co.
Tractor & Equipment Co.
Worthington Pump & Machy. Corp.

Engines (Internal-Combustion)
Atlas Imperial Diesel Engine Co.
Buckeye Machine Co.
*Cooper-Bessemer Corp.
Cummins Engine Co.
International Harvester Co.
Nordberg Mfg. Co.
Tractor & Equipment Co.
Worthington Pump & Machy. Corp.

Engines (Steam)
*Morris Machine Works
Nordberg Mfg. Co.

Excavating Machinery (See Shovels; Cranes; Buckets, etc.)

Excavators—Shallow Grading (Bucket Elevator Type)
Haiss Mfg. Co., Geo.

Explosives
Du Pont de Nemours & Co.

Fans (Exhaust)
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.

Feeders
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
*Bartlett & Snow Co., C. O.
Bonnot Co.
*Fuller Co.
*Hardinge Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Link-Belt Co.
*Pioneer Gravel Equipment Mfg. Co.
*Robins Conveying Belt Co.
Smith Engr. Works

Feed Water Heaters
Worthington Pump & Machy. Corp.

Floor Sweeping Systems (Hydro Vacuum)
*Allen-Sherman-Hoff Co.

Forges (Oil)
Gardner-Denver Co.

Fuses (Detonating)
Du Pont de Nemours & Co.
*Ensign-Bickford Co.

Gaskets
Goodyear Tire & Rubber Co.
Hewitt Rubber Corp.
Republic Rubber Co.

Gasoline Engines (See Engines—Internal-Combustion)

Gas Producers
Wellman Engr. Co.

Gates (Bin) (See Bin Gates)

Gates (Clamshell)
Haiss Mfg. Co., Geo.
*Link-Belt Co.

Gears (Herringbone)
*Bartlett & Snow Co., C. O.
*Jeffrey Mfg. Co.
*Link-Belt Co.

Gears and Pinions
*Bartlett & Snow Co., C. O.
Haiss Mfg. Co., Geo.
*Jeffrey Mfg. Co.
*Link-Belt Co.

Gelatin (See Explosives)

Generators (See Motors and Generators)

Glass Sand Equipment
Lewistown Foundry & Machine Co.

Grab Buckets (See Buckets—Clamshell, Orange-Peel, etc.)

Grapples
Owen Bucket Co.

Grating (Steel)
*Bartlett & Snow Co., C. O.
*Blaw-Knox Co.
*Hendrick Mfg. Co.
Ryerson & Son, Joseph T.

Grinding Balls (See Balls, Grinding)

Grizzlies
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
*Bartlett & Snow Co., C. O.
*Eagle Iron Works
*Hendrick Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Fdy. & Mach. Co.
Manganese Steel Forge Co.
*Robins Conveying Belt Co.
Smith Engr. Works
*Traylor Engr. & Mfg. Co.

Guards (Wire)
*Bartlett & Snow Co., C. O.
Manganese Steel Forge Co.

Guns (Hydraulic)
Hetherington & Berner, Inc.
Taylor Forge & Pipe Works

Hammer Mills (See Crushers—Hammer)

Hoists
*Bartlett & Snow Co., C. O.
Gardner-Denver Co.
Hetherington & Berner, Inc.
*Jeffrey Mfg. Co.
*Link-Belt Co.
McLanahan and Stone Corp.
*Pioneer Gravel Equipment Mfg. Co.
*Sauerman Bros., Inc.
Smith Engr. Works

Hoppers
*Hendrick Mfg. Co.
*Link-Belt Co.
Manganese Steel Forge Co.

Hose (Air, Steam and Water)
Goodyear Tire & Rubber Co.
Hewitt Rubber Corp.
Republic Rubber Co.
Worthington Pump & Machy. Corp.

Hose (Radiator-Engine Cooling)
Goodyear Tire & Rubber Co.
Republic Rubber Co.

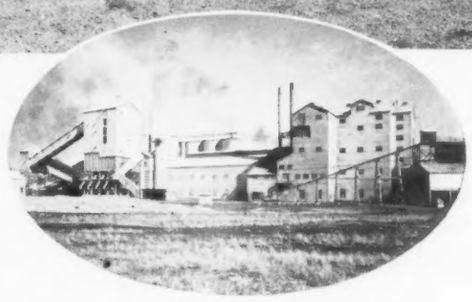
Hose Couplings (See Couplings)

Hydraulic Guns (See Guns—Hydraulic)

Idlers
American Manganese Steel Co.
*Bartlett & Snow Co., C. O.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.
Smith Engr. Works

Kilns and Coolers (Rotary)
*Allis-Chalmers Mfg. Co.
*Bartlett & Snow Co., C. O.
Bonnot Co.
*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Traylor Engr. & Mfg. Co.

*** See also information in the 1936 Pit and Quarry HANDBOOK.**



CORDEAU-BICKFORD *at the* Kelley Island Lime *and* Transport Company

They want "little pieces" at the White Rock Plant at Clay Center, Ohio. Little pieces mean easier removal; save time, save shovels, save powder.

Better Fragmentation is but one of the five reasons why Cordeau-Bickford Detonating Fuse is used here—as elsewhere in the quarrying industry.

Here are the five reasons:

1. More Work from Explosives: each cartridge is detonated directly and has the added force of a primer cartridge.
2. Simplified Loading: there are no caps in the holes.
3. Less Hazard: Cordeau-Bickford is insensitive to ordinary shocks. It must be detonated.
4. Fewer but Bigger Shots: equipment moved less often, for Cordeau-Bickford not only detonates each hole but connects all holes.
5. Better Fragmentation: planned rotation firing, possible with Cordeau, permits split second relief of burden, letting each charge work to best advantage.

Cordeau-Bickford Detonating Fuse is manufactured with the same care that has made Ensign-Bickford Safety Fuse famous since 1836. Let us send you a copy of our Centennial Booklet—and tell you more about Cordeau.

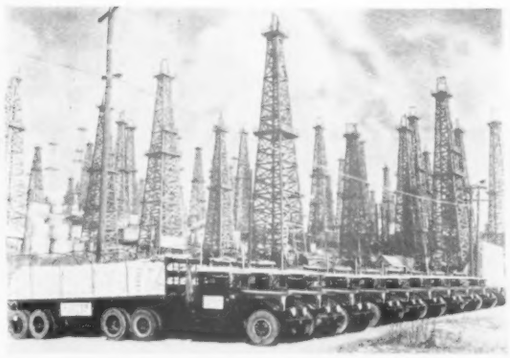
CB52

The ENSIGN-BICKFORD Company

Simsbury, Connecticut

Safety Fuse since 1836. **Cordeau-Bickford Detonating Fuse**

Read the record



Cement Company *Uses* CUMMINS-DIESELS *for "plant to job" delivery*

In December, 1934, the Southwestern Portland Cement Company purchased four Cummins-Diesel powered Sterling trucks to deliver their cement direct from plant to job. In July, 1935, after a thorough test, they purchased two more, followed by two more in October and two more in December.

Large companies, whose every operating cost, including delivery, is a matter of "Record", do not re-purchase the same kind of delivery equipment *again and again and again*, unless it has proved its operating economy, low maintenance and unquestioned dependability.

That's why we urge you to "Read the Record" . . . to learn for yourself how Cummins-Diesels can reduce your delivery costs, even on short hauls. Cummins Engine Company, 805 Wilson Street, Columbus, Indiana.

CUMMINS

INDUSTRIAL · AUTOMOTIVE AND MARINE

DIESELS

Classified Buyers' Guide

A Directory of PIT AND QUARRY Advertisers Arranged According to Product

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Kilns (Vertical)
*Hardinge Co.

Lime-Handling Equipment
*Bartlett & Snow Co., C. O.
*Fuller Co.
*Hardinge Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Raymond Bros Impact Pulv. Co.
*Robins Conveying Belt Co.

Lime and Hydrating Plants
*Hardinge Co.

Lime Kilns
*Bartlett & Snow Co., C. O.
*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.

Linings (Ball- and Tube-Mill (See Mill Liners and Linings)

Loaders and Unloaders
*Bartlett & Snow Co., C. O.
*Fuller Co.
Haiss Mfg. Co., Geo.
Industrial Brownhoist Corp.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

Locomotives (Diesel)
*Brookville Locomotive Co.
Tractor & Equipment Co.

Locomotives (Electric, Gas, Kerosene and Steam)
*Brookville Locomotive Co.
*Lima Locomotive Works
Tractor & Equipment Co.

Locomotives (Trolley-Battery)
*Jeffrey Mfg. Co.

Magnetic Pulleys (See Pulleys, Magnetic)

Manganese Steel
American Manganese Steel Co.
Manganese Steel Forge Co.
Ryerson & Son, Joseph T.

Manganese Steel (Plates and Sheets)
American Manganese Steel Co.
Manganese Steel Forge Co.
Ryerson & Son, Joseph T.

Mechanical Rubber Goods
Goodyear Tire & Rubber Co.
Hewitt Rubber Corp.
Republic Rubber Co.

Mill Liners and Linings
American Manganese Steel Co.
*Bartlett & Snow Co., C. O.
Carnegie-Illinois Steel Corp.
*Hardinge Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.

Mills (Grinding) (See also Crushers—Hammer)
*Allis-Chalmers Mfg. Co.
*Bartlett & Snow Co., C. O.
Bonnot Co.
*Hardinge Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Fdy. & Mch. Co.
*Raymond Bros. Impact Pulv. Co.
*Traylor Engr. & Mfg. Co.
*Williams Pat. Crusher & Pulv. Co.

Motors and Generators
*Allis-Chalmers Mfg. Co.

Motors (Internal-Combustion) (See Engines—Internal-Combustion)

Motor Trucks
International Harvester Co.

Motor Trucks (Dual Rear Axle Drive Units)
Thornton Tandem Co.

Nails
Ryerson & Son, Joseph T.

Netting (Locomotive Stack)
Tyler Co., W. S.

Nozzles (Gravel Washing)
*Deister Concentrator Co.

Nozzles (Hydraulic) (See Guns—Hydraulic)

Nozzles (Spray)
*Deister Concentrator Co.

Packings
Goodyear Tire & Rubber Co.
Hewitt Rubber Corp.
Republic Rubber Co.

Paving Mixers
Jaeger Machine Co.
*Koehring Co.

Perforated Metal Plates
*Allis-Chalmers Mfg. Co.
*Bartlett & Snow Co., C. O.
Chicago Perforating Co.
*Hendrick Mfg. Co.
Ryerson & Son, Joseph T.

Pipe, Dredge (Floating and Shore)
Taylor Forge & Pipe Works

Pipe Flanges
Hetherington & Berner, Inc.
Taylor Forge & Pipe Works
Ryerson & Son, Joseph T.

Pipe Forms (Concrete)
Quinn Wire & Iron Works

Pipe Machines (Concrete)
Quinn Wire & Iron Works

Plants (Aggremeter) (See Aggremeter Plants)

Plug Valves (See Valves)

Pneumatic Drills (See Drills, Rock)

Portable Conveyors
*Fuller Co.
Haiss Mfg. Co., Geo.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

Portable Crushing and Screening Plants
*Austin-Western Road Machy. Co.
*Bartlett & Snow Co., C. O.
*Gruendler Crusher & Pulverizer Co.
*Jeffrey Mfg. Co.
*Pioneer Gravel Equipment Mfg. Co.
Tractor & Equipment Co.
*Williams Pat. Crusher & Pulv. Co.

Portable Engines (See Engines—Internal Combustion)

Portable Loaders (See Loaders and Unloaders)

Power Shovels (See Shovels, Electric, Internal-Combustion and Steam)

Proportioning Equipment
*Blaw-Knox Co.

Pulverized Fuel Systems
*Bartlett & Snow Co., C. O.
*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Raymond Bros. Impact Pulv. Co.

Pulverizers (See also Crushers; Mills; etc.)
*Austin-Western Road Machy. Co.
*Bartlett & Snow Co., C. O.
Bonnot Co.
*Gruendler Crusher & Pulverizer Co.
*Hardinge Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machinery Co.
New Holland Machine Co.
*Raymond Bros. Impact Pulv. Co.
Traylor Engr. & Mfg. Co.
*Williams Pat. Crusher & Pulv. Co.

Pump Parts
American Manganese Steel Co.

Pump Valves (See Valves, Pump)

Pumps (Air-Lift)
*Fuller Co.

Pumps (Bulk Cement)
*Fuller Co.

Pumps (Cement Slurry)
*Allen-Sherman-Hoff Co.
*Morris Machine Works

Pumps (Centrifugal)
*Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Hetherington & Berner, Inc.
*Morris Machine Works
Worthington Pump & Machy. Corp.

Pumps (Dredging)
*Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Hetherington & Berner, Inc.
*Morris Machine Works
Worthington Pump & Machy. Corp.

Pumps (Sand and Gravel
*Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Hetherington & Berner, Inc.
*Morris Machine Works

Pumps (Vacuum)
*Fuller Co.

Ready-Mixed Concrete Plants
*Bartlett & Snow Co., C. O.

Rock Drills (See Drills—Rock)

Rod Mills
*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Traylor Engr. & Mfg. Co.

Rods (Welding)
American Manganese Steel Co.
Ryerson & Son, Joseph T.
Stulz-Sickles Co.

Roofing and Siding (Steel)
Ryerson & Son, Joseph T.

Rope (Wire) (See Wire Rope)

Sand Separators
*Bartlett & Snow Co., C. O.
*Jeffrey Mfg. Co.
*Link-Belt Co.
McLanahan and Stone Corp.
*Pioneer Gravel Equipment Mfg. Co.
Simplicity Engr. Co.
Smith Engr. Works

Sand—Lime—Brick Machinery
*Hardinge Co.

Sand-Settling Tanks
*Bartlett & Snow Co., C. O.
Good Roads Machy. Corp.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Pioneer Gravel Equipment Mfg. Co.
Smith Engr. Works

Scrapers (Power Drag)
*Austin-Western Road Machy. Co.
*Link-Belt Co.
*Pioneer Gravel Equipment Mfg. Co.
*Sauerman Bros., Inc.
Tractor & Equipment Co.

Screens
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Audubon Wire Cloth Corp.
Bacon, Inc., Earle C.
*Bartlett & Snow Co., C. O.
Carnegie-Illinois Steel Corp.
Chicago Perforating Co.
Cleveland Wire Cloth & Mfg. Co.
*Deister Concentrator Co.
*Deister Machine Co.
*Eagle Iron Works
*Gruendler Crusher & Pulverizer Co.
Haiss Mfg. Co., Geo.
*Hardinge Co.
*Hendrick Mfg. Co.
Industrial Brownhoist Corp.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machinery Co.
*Link-Belt Co.
Manganese Steel Forge Co.
McLanahan and Stone Corp.
Nordberg Mfg. Co.
*Pioneer Gravel Equipment Mfg. Co.
*Productive Equip. Corp.
*Robins Conveying Belt Co.
*Roebling's Sons Co., John A.
Simplicity Engr. Co.
Smith Engr. Works
Symons Bros. Development Co.
Tractor & Equipment Co.
*Traylor Engr. & Mfg. Co.
*Tyler Co., W. S.

Screens (Vibrating or Shaking)
*Allis-Chalmers Mfg. Co.
*Austin-Western Road Machy. Co.
*Bartlett & Snow Co., C. O.
*Deister Concentrator Co.
*Deister Machine Co.
*Gruendler Crusher & Pulverizer Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machinery Co.
*Link-Belt Co.
McLanahan and Stone Corp.
New Holland Machine Co.
Nordberg Mfg. Co.
*Pioneer Gravel Equipment Mfg. Co.
*Productive Equip. Corp.
*Robins Conveying Belt Co.
Simplicity Engr. Co.
Smith Engr. Works
Symons Bros. Development Co.
Tractor & Equipment Co.
*Tyler Co., W. S.
*Williams Pat. Crusher & Pulv. Co.

Scrubbers
*Tyler Co., W. S.

Separators (Air) (See Air Separators)

Sheaves
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
*Eagle Iron Works
*Gruendler Crusher & Pulverizer Co.
Haiss Mfg. Co., Geo.
Hetherington & Berner, Inc.
*Link-Belt Co.
*Jeffrey Mfg. Co.
McLanahan and Stone Corp.

Shovels (Electric, Internal-Combustion and Steam)
*Austin-Western Road Machy. Co.
Industrial Brownhoist Corp.
*Koehring Co.
*Lima Locomotive Wks., Inc.
*Link-Belt Co.
Michigan Power Shovel Co.
Northwest Engr. Co.
Tractor & Equipment Co.

Shovels (Tractor)
Tractor & Equipment Co.
Trackson Co.

Skip Hoists and Skips
*Allis Chalmers Mfg. Co.
*Bartlett & Snow Co., C. O.
Hetherington & Berner, Inc.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

Speed Reduction Units
*Link-Belt Co.

Spouts (See Chutes and Chute Liners)

Sprays
*Deister Concentrator Co.

Sprockets and Chain
American Manganese Steel Co.
*Bartlett & Snow Co., C. O.
*Jeffrey Mfg. Co.
*Link-Belt Co.

Stabilized Road Mix
Calcium Chloride Assn.

Stackers
*Jeffrey Mfg. Co.

Steel (Abrasion Resisting)
Ryerson & Son, Joseph T.

Steel (Bars, Shapes, Plates, etc.)
Ryerson & Son, Joseph T.

Steel (Alloy)
(See Alloys—Steel)

Steel Grating (See Grating, Steel)

Steel Plate Construction
Hetherington & Berner, Inc.
Manganese Steel Forge Co.
Ryerson & Son, Joseph T.

Stone Grapples
Owen Bucket Co.

Storage Equipment
Bartlett & Snow Co., C. O.
Haiss Mfg. Co., Geo.
*Jeffrey Mfg. Co.
*Kern Co., Fred T.
*Link-Belt Co.
*Sauerman Bros., Inc.

Sweeping Systems
*Allen-Sherman-Hoff Co.

Tanks
*Bartlett & Snow Co., C. O.
*Hendrick Mfg. Co.
*Link-Belt Co.

Tanks (Sand-Settling)
*Bartlett & Snow Co., C. O.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Pioneer Gravel Equipment Mfg. Co.
Smith Engr. Works

Testing Sieves and Shakers
*Hendrick Mfg. Co.
*Tyler Co., N. S.

*** See also information in the 1936 Pit and Quarry HANDBOOK.**

Lowest Cost per Cu. Yard

Quality in a Loader is even more important, today, than ever before. Your equipment has got to pay for itself on a small profit margin. You cannot afford a machine that won't **stand up.** You know a HAISS **will.** And you also know that it is easier to handle and does **a bigger day's work.**

Write for catalog and 1936 prices on the model that fits your need

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MODEL "135" 5 yds. per min.
MODEL "80" 3 yds. per min.
MODEL "27" 2 yds. per min
MODEL "50" 1½ yds. per min

HAISS

"Path Digging" **LOADERS**

ALSO: CLAMSHELL BUCKETS . . HOPPER GATES . . SCREENS . . ELEVATORS . . CONVEYORS & PARTS.

What do You look for in a
TRUCK SHOVEL

Performance
Convertibility
Dependability
Economy
Stamina
Speed

?

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model T-6
MICHIGAN *has them all!*

MICHIGAN POWER SHOVEL Co BENTON HARBOR, MICHIGAN, U.S.A.

Classified Buyers' Guide

A Directory of PIT AND QUARRY Advertisers Arranged According to Product

Index to Advertisers on Page 96

Thickeners (Slurry)
*Hardinge Co.

Tire Repair Materials
General Tire & Rubber Co.
Goodyear Tire & Rubber Co.

Tires (Tractor, Truck and Passenger Car)
General Tire & Rubber Co.
Goodyear Tire & Rubber Co.

Tools (Drill) (See Drilling Accessories)

Track Shifters
Nordberg Mfg. Co.

Tractors
*Allis-Chalmers Mfg. Co.
International Harvester Co.
Tractor & Equipment Co.

Tractor Shovels
Trackson Co.
Tractor & Equipment Co.

Trailers (Motor Truck)
International Harvester Co.

Tramways (Aerial)
*Roebling's Sons Co., John A.

Transformers
*Allis-Chalmers Mfg. Co.

Transmission Belting (See Belting)

Transmission Machinery
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
*Bartlett & Snow Co., C. O.
*Gruendler Crusher & Pulverizer Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.

Trippers
*Bartlett & Snow Co., C. O.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

Truck Cranes (See Cranes)

Truck Mixers
*Bartlett & Snow Co., C. O.
*Blaw-Knox Co.
Jaeger Machine Co.

Trucks and Trailers (See Motor Trucks)

Tube-Mills (See Mills — Ball, Tube, etc.)

Tubes (For Tire Casings)
General Tire & Rubber Co.
Goodyear Tire & Rubber Co.

Underground Loaders
*Allis-Chalmers Mfg. Co.
*Bartlett & Snow Co., C. O.

Unloaders (Box Car)
*Bartlett & Snow Co., C. O.
*Fuller Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.

Valves (Air)
Worthington Pump & Machy. Corp.

Valves (Pump)
Taylor Forge & Pipe Works

Variable Speed Reducers or Transmissions
*Link-Belt Co.

Vibrating Screen Plate
*Bartlett & Snow Co., C. O.
Chicago Perforating Co.
*Hendrick Mfg. Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
Manganese Steel Forge Co.

Vibrating Screens (See Screens —Vibrating)

Vibrators
*Jeffrey Mfg. Co.
*Tyler Co., W. S.

Wagons (Dump)
*Koehring Co.

Washers (Sand, Gravel and Stone)
*Allis-Chalmers Mfg. Co.
*Bartlett & Snow Co., C. O.
*Eagle Iron Works
Haiss Mfg. Co., Geo.
*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Mach. Co.
*Link-Belt Co.
McLanahan and Stone Corp.
*Pioneer Gravel Equipment Mfg. Co.
Smith Engr. Works
*Traylor Engr. & Mfg. Co.
*Tyler Co., W. S.

Weighing Equipment (Automatic
*Blaw-Knox Co.
Johnson Co., C. S.

Welding and Cutting Equipment
Ryerson & Son, Joseph T.
Stulz Sickles Co.

Welding Supplies
American Manganese Steel Co.
Manganese Steel Forge Co.
*Roebling's Sons Co., John A.
Ryerson & Son, Joseph T.
Stulz Sickles Co.

Well Drills (See Drills—Well)

Wheels (Car)
American Manganese Steel Co.
*Eagle Iron Works

Wheel Rims. See Rims—Wheel

Winches and Capstans
*Bartlett & Snow Co., C. O.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

Wire and Cable (Electric)
*Roebling's Sons Co., John A.

Wire Cloth
Audubon Wire Cloth Corp.
Cleveland Wire Cloth & Mfg. Co.
Manganese Steel Forge Co.
*Robins Conveying Belt Co.
*Roebling's Sons Co., John A.
Tyler Co., W. S.

Wire Rope
American Cable Co.
Broderick & Bascom Rope Co.
*Roebling's Sons Co., John A.
Ryerson & Son, Joseph T.
*Williamsport Wire Rope Co.

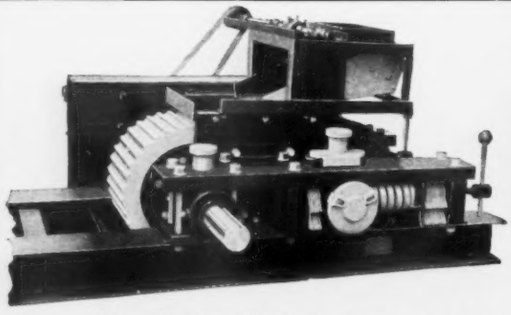
Wire Rope Fittings
American Cable Co.
Broderick & Bascom Rope Co.
*Page Engr. Co.
*Roebling's Sons Co., John A.
Ryerson & Son, Joseph T.
*Williamsport Wire Rope Co.

Wire Rope Slings
American Cable Co.
Broderick & Bascom Rope Co.
*Roebling's Sons Co., John A.
*Williamsport Wire Rope Co.

Wire (Welding)
American Manganese Steel Co.
Manganese Steel Forge Co.
*Roebling's Sons Co., John A.
Ryerson & Son, Joseph T.

Worm Gears (See Gears and Pinions)

* **See also information in the 1936 Pit and Quarry HANDBOOK.**



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SCREENS

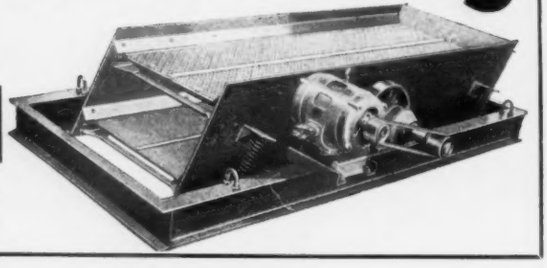
New Holland Roll Crushers with New Holland Pulsating Feeders double the roll capacity. Ribbed shells increase the angle of grip and make less dust. Built in a wide range of sizes.

New Holland Vibrating Screens for light and heavy duty. Rubber cushioned cloth and bumpers. Stretched cloth. All sizes in one, two, and three decks.

Write for Bulletins.

New Holland Machine Co.

P. O. Box No. 200 New Holland, Penna.



Travellers Tidings

NO HIGHER PRICE POLICY FOR DETROIT HOTEL

Clifford R. Taylor Managing Director Announces Plan for

HOTEL TULLER

FACING GRAND CIRCUS PARK

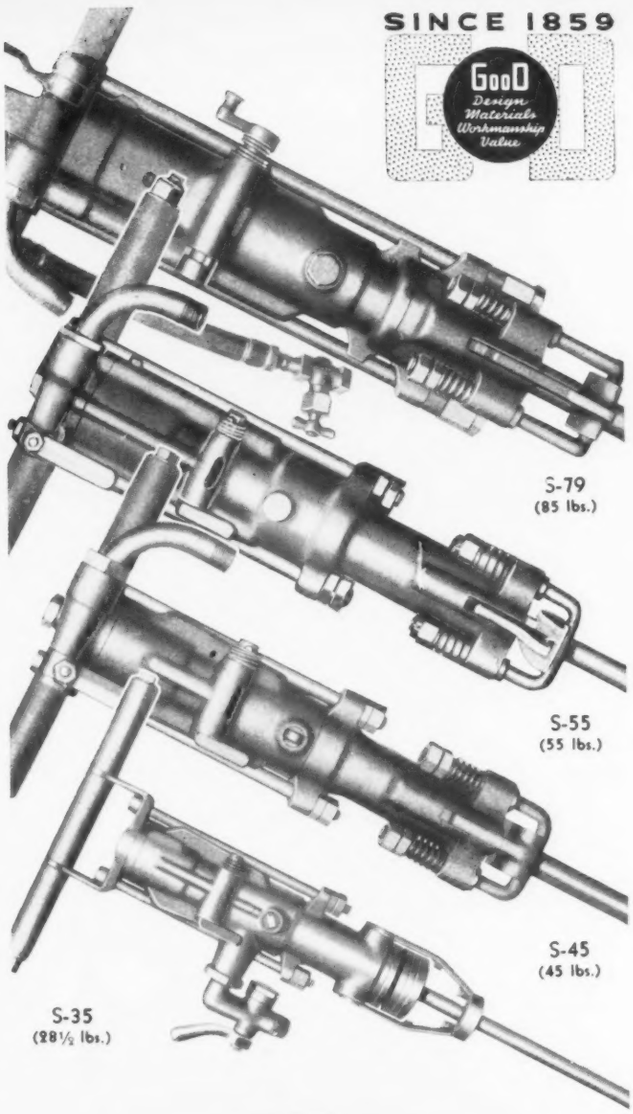
800 ROOMS

Travellers everywhere are talking about Hotel Tuller's new $2.-$2.50-$3. NO HIGHER price for a large comfortable single room with bath. Wonderful location right in downtown Detroit – facing Grand Circus Park – with every conceivable comfort and luxury as well as the finest of food

$2. $2.50 $3.

SINCE 1859

GOOD Design Materials Workmanship Value

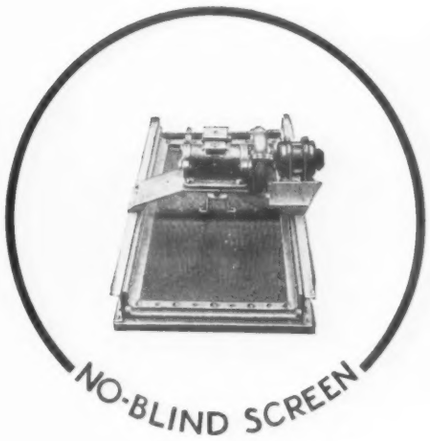


MORE FOOTAGE PER SHIFT—EVERY SHIFT

GARDNER-DENVER COMPANY
102 Williamson Street Quincy, Illinois

GARDNER-DENVER

Fine Screening
by THE *Leahy*



"The best feature—
economy of operation"
—says a Prominent Producer.

Here is a practical tribute to the fine screening ability of the Leahy Line:

"We installed six Leahy No-Blind Vibrating Screens in 1929, and they have been in continuous service to the present date. They are screening materials ranging from 3/16" to 3" and maintaining our average plant capacity of 100 tons per hour. In our opinion, the best feature of the Leahy Screen is ***economy of operation.*** Only minor repairs and adjustments have been necessary to keep them in good working order."

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Six **LEAHY** Screens operating in this modern sand and gravel plant.

We also manufacture Sand Classifiers and the Deister-Overstrom Diagonal Deck Washing Table which produces a premium product at minimum cost. Write for bulletin.

THE ORIGINAL
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911 Glasgow Ave. Ft. Wayne, Ind.

Dry it in a "Ruggles-Coles" Rotary Dryer

Either by direct heat—indirect heat—steam—or tempered gas. There are more Ruggles-Coles Dryers in use than Dryers of any other make. What is your problem?

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INCORPORATED

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Main Office & Works—122 E. 42nd St.,—205 W. Wacker Drive

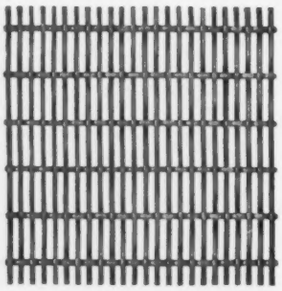
KIMBALL KROGH PUMPS AT COULEE DAM

THE world's biggest sand washing and handling job is using Kimball Krogh Sludge Pumps for Coulee Dam. These pumps reclaim the water used in washing the materials, and thus salvage the fine sizes of sand, ordinarily wasted. Kimball Krogh Pumps handle the sludge from the clarifiers to the sand washers at a rate of 300 tons per hour at a 50% concentration. For dependable service on your pumping jobs, you can specify Kimball Krogh equipment with confidence and economy.

Information on request.

VICTOR EQUIPMENT COMPANY
Kimball Krogh Pump Division

1010 E. 62nd St. Los Angeles
515 Harrison St. San Francisco



Rolled Slot

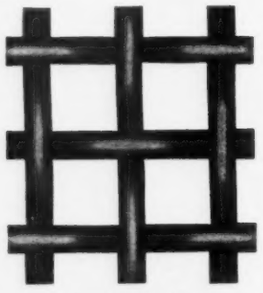
ALLOY No. 2

A super wearing Steel developed to resist the abrasion and vibration of modern screening demands.

"CLEVELAND" SCREENS

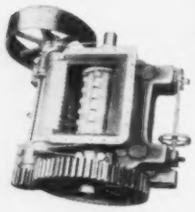
A wire cloth of guaranteed accuracy backed by fine workmanship and an effort to satisfy.

Available in Square Mesh and Rolled Slot. A trial will convince you of the superiority.



2 Mesh .162 Ga.

THE CLEVELAND WIRE CLOTH & MFG. COMPANY
3574 E. 78th St. CLEVELAND, OHIO



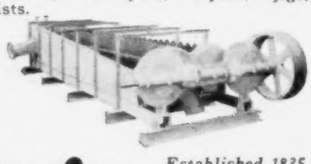
McLANAHAN EQUIPMENT

CRUSHERS

Single and double roll and jaw crushers, hammer mills, super dry pans—steel log washers and scrubbers, sand drags, revolving and vibrating screens, elevators, conveyors, dryers, jigs, hoists.

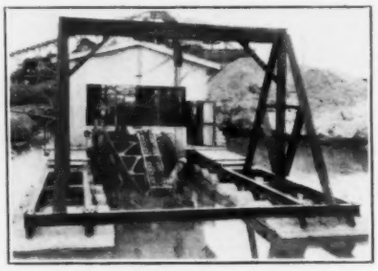
SCREENS

Complete portable, semi-portable and stationary crushing, screening and washing plants for different capacities of any materials.



McLanahan & Stone Corp. *Established 1835* HOLLIDAYSBURG, PENNSYLVANIA

EAGLE SWINTEK SCREEN NOZZLE LADDER LOWER YOUR COST



Will eliminate stoppages and slug pumping—insuring an even, constant feed of solids to the suction nozzle—with less power—greatly decreasing the cost per yard of material produced.

Write for descriptive literature and let us tell you how this can be done with your dredge.

Eagle Iron Works
Des Moines, Iowa

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ALL materials, fine or coarse, light or heavy . . . clay, gravel, sand, ores, stone, etc. . . . yield to the wizardry of the mechanically-vibrated, Link-Belt Vibrating Screen, and classify themselves in strict accordance with their size. Its uniform vibration keeps the meshes open, and makes the screen's entire screening surface 100% effective. Send for Book No. 1462.

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LINK-BELT COMPANY 5366

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•Trouble-free operation is assured. No wear—no filtering units to replace—no manual supervision—no fire hazard. Highly efficient. Descriptive literature sent on request. The C. O. Bartlett & Snow Co., 6197 Harvard Ave., Cleveland, Ohio. Representatives in the principal cities.

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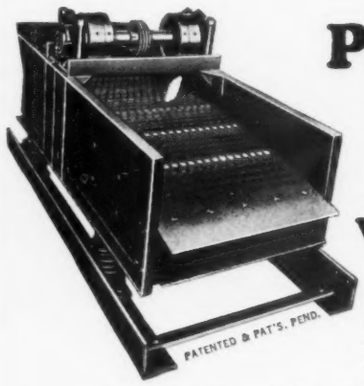
BARTLETT-SNOW Dust Collectors

CONVEYORS • ELEVATORS • SKIP HOISTS • FEEDERS
CHAINS • SPROCKETS • DRYERS • COOLERS • SCREENS

COMPOUND FUNNEL CLASSIFIER

For sizing minus 5/16" gravel and sand, and for cleaning it by washing out silt and other light impurities.

Descriptive Bulletin No. 23



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Improved Heavy Duty

VIBRATING SCREEN

Built in all standard sizes and in from one to three decks.

Write for Descriptive Bulletin No. 22

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Protect the New

MANGANAL

11 to 13½% Nickel Manganese Steel

New shovel teeth protected from wear with Manganal Applicator Filler Bars

Restore the Old

Apply MANGANAL Applicator (Filler) Bars to build up wear resisting surfaces on new parts, and to rebuild worn away sections of manganese and carbon steel surfaces—for increasing the service life of dipper teeth, pump shells, crusher plates and other equipment parts.

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Diesel and Gas Engines from 30 to 1250 H.P. for Every Power Need

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Gas, Power & Equipment Co., Birmingham, Alabama

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A Type and size for any requirement or problem you may have.

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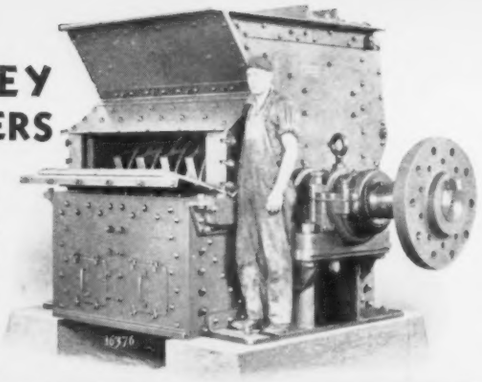

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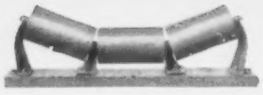
Conveyor Idlers



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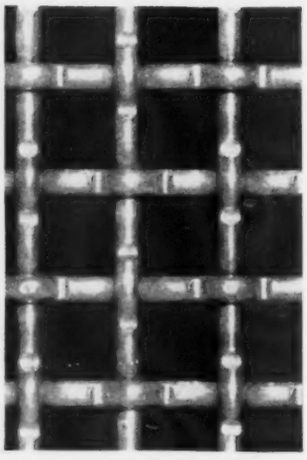

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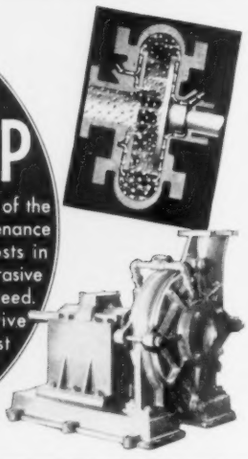

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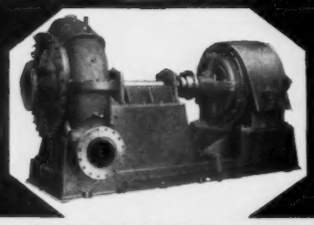

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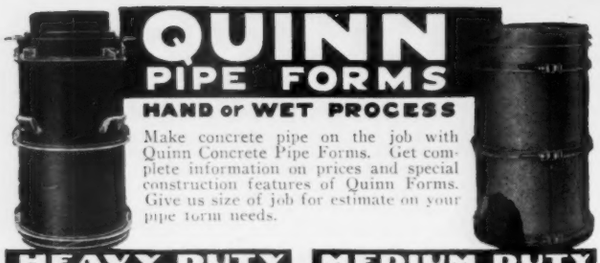

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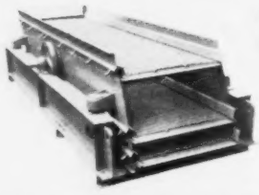

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300	G. E. sl. rg.	585
260	Al. Ch. Syn.	720
250	F. M. sl. rg.	1200
200	West. sl. rg.	900
200	G. E. sl. rg.	900
150	G. E. sl. rg.	1750
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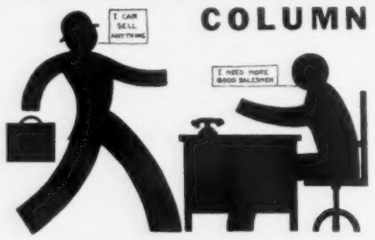

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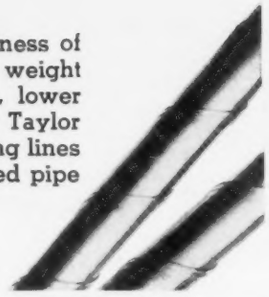

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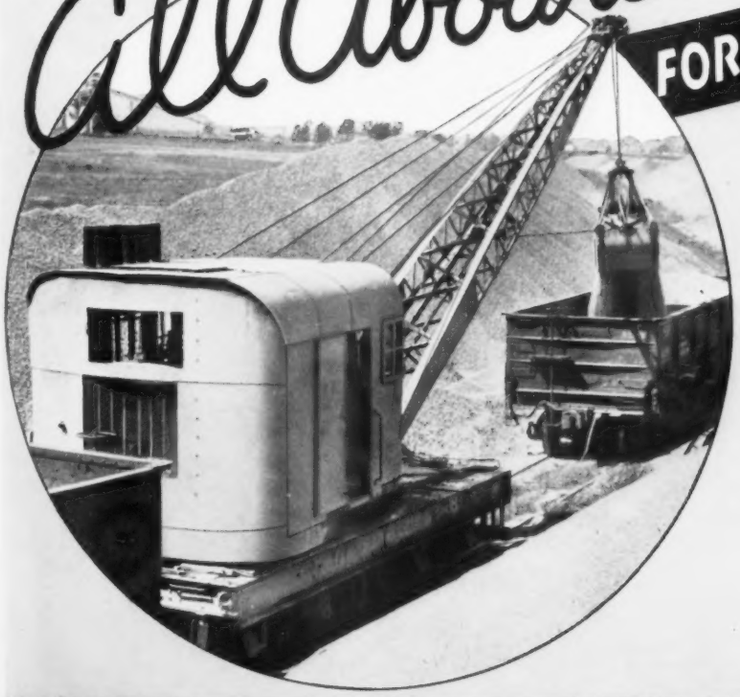

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